UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 8
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Ref: EPR-ER

ACTION MEMORANDUM AMENDMENT

SUBJECT: Request for a Ceiling Increase and a Modification of the Proposed Scope of Response for the Time-Critical Removal Action at the Flat Creek/Iron Mountain Mine and Mill (IMM) NPL Site – Residential Operable Unit 1 (OU1) [RV3] Located in and around the Town of Superior, Mineral County, Montana.

FROM: Due Nguyen, On-Scene Coordinator (OSC)
Emergency Response Unit

for THROUGH: Curtis Kimbel, Supervisor
Emergency Response Unit

TO: David Ostrander, Director
Preparedness, Assessment & Emergency Response Program

Site ID#: 08ER
CERCLIS ID#: MT0012694970
Category of Removal: Time-Critical, Fund-Lead

I. PURPOSE

The purpose of this Action Memorandum Amendment ("Amendment") is to request and document approval of: 1) a ceiling increase; 2) a modification of the existing scope of response; and 3) a continuation of an exemption from the 12-month and $2 million statutory limits for the existing Time-Critical Removal Action (TCRA) described herein for the Flat Creek/IMM NPL Site – Residential Operable Unit (OU1) located in and around the town of Superior, Montana. The ceiling increase is necessary to construct a permanent mine waste repository authorized by the TCRA Memorandum dated June 10, 2010 and to address the six newly identified properties with similar threats as described in the Amendment.

The initial Removal Action was authorized by the TCRA Memorandum (August 2, 2002) to address soil contamination found at a high school track, certain roads, and residences in Superior. Approximately 6,500 cubic yards of contaminated materials were removed and stored at the Mineral County Airport repository. Subsequently, the TCRA Memorandum (June 10, 2010) was approved to continue removal of contaminated residential soils in Superior. During the course of removal activities and Remedial Investigation (Phase 3) in 2010, sampling results indentified six additional residential properties with the same threats as those identified in previous Action Memorandums. In addition, a permanent on-site repository will be constructed tentatively in September 2011, located in the Wood Gulch area (OU2). The repository will

receive wastes generated from response actions associated with OU1 and OU2, including the TCRA 2002-contaminated soil currently stored at Mineral County Airport. Therefore, this Amendment requests additional funds to address those Removal Actions.

The remedy for this Removal Action remains the same as outiined in TCRA Memorandums (August 2, 2002 and June 10, 2010) and will be consistent with any future Remedial Actions which may be taken.

II. SITE CONDITIONS AND BACKGROUND

On September 23, 2009, EPA formally added the Flat Creek/IMM Superfund Site (CERCLIS ID No. MT0012694970) to its National Priorities List (NPL) of Superfund sites. The Site is a result of abandoned historic hard-rock mining and milling operations. IMM operated from 1909-1930 and from 1947-1953 producing silver, gold, lead, copper and zinc ores. The Flat Creek/IMM NPL Site is located partially on private land and partially on Forest Service lands within and adjacent to the established boundaries of the Lolo National Forest. Some lands within the Site are the property of the town of Superior and Mineral County. The Forest Service lands portion of the Site is administered by the Lolo National Forest, Superior District.

Attachment 1 and 2, TCRA Memorandums dated August 2, 2002 and June 10, 2010, provide the basic description of the Flat Creek/IMM NPL Site and will not be repeated here.

The Site is generally subdivided into three operable units (OUs):

- Operable Unit 1 (OU1): EPA is the lead agency for the OU1 response actions, which addresses the contamination in the residential/commercial/public areas in and around Superior.

- Operable Unit 2 (OU2): EPA will be the lead agency for conducting the Remedial Investigation/Feasibility Study and development of a Record of Decision (ROD), in consultation with Montana Department of Environmental Quality (DEQ) and US Forest Service (USPS).

  The USFS will be the lead agency for response actions that take place on or within the boundaries of National Forest System land (NFS) in OU2. Such response actions will include the removal of contaminated tailing deposits on NFS along Flat Creek and to address the former contaminated drinking water source.

  MDEQ will be the lead agency for the remaining OU2. Response actions will include abandoned mine and milling properties, contaminated sediments in and near Flat Creek, and a discharging adit at the Iron Mountain Mine.

- Operable Unit 3 (OU3): A local permanent repository will be constructed at the Wood Gulch area to hold the contaminated soil generated from response actions associated with OU1 and OU2. The design and initial construction of the Wood Gulch Repository will be completed by EPA – Region 8 Removal Program. The cost of the repository will be borne by each responding agency in direct proportion to the amount of waste that the agency deposits in the repository. The State will be responsible for operating and maintenance (O&M) cost.

A. Site Description

1. Physical Location

This Removal Action addresses six newly identified contaminated properties, which are located within Superior. All of the cleaned properties from 2002 and 2010 seasons and the newly identified properties are shown in Figure 2.

The proposed repository is located two miles north of Superior, in eastern Mineral County, Montana. The repository site is located within the southeast ¼ of the southwest ¼ of Section 14 and extends a short distance into the southwest ¼ of the southeast ¼ of Section 14 of Township 17 N Range 26 W of the Montana Principal Meridian (Please see Attachment 5).

2. Removal Site Evaluation:

Permanent Repository:

- In an August 29, 2008 letter from the Mineral County Board of Commissioners to Gwen Christiansen (NPL Coordinator), among other issues the letter stated "the County would like consideration for removal of the hazardous material repository located near the Mineral County Airport. We believe that if a new repository is developed as part of the comprehensive cleanup plan, then all materials should be managed in that location." In the September 19, 2008 response letter signed by David Ostrander (Director of Preparedness, Assessment and Response Program) to the Mineral County Board of Commissioners, Mr. Ostrander said, "It's typical at the Superfund mine site cleanups to share a single on-site repository, since it's usually the most cost effective long-term solution for isolating similar wastes. As part of the feasibility study for this Site, EPA will consider consolidating all mine waste within a single repository, including those that were placed in the airport repository during the Time-Critical Removal Action."

- In a December 24, 2008 letter from the Mineral County Board of Commissioners to Governor Schweitzer requesting his support for NPL listing for the Site, a similar request for consolidating all mine waste within a single repository was also referenced. It was stated "The existing contaminated material repository on County property east of the Mineral County Airport should be moved to a permanent repository or waste site."

- A January 6, 2009 letter from Governor Schweitzer to Carol Rushin (Assistant Regional Administrator (ARA) of Ecosystems Protection and Remediation) supported NPL listing for the Site and encouraged EPA to address the concerns raised in the December 24, 2008 Mineral County letter.

- In a response letter dated January 22, 2009 from Carol Rushin to Governor Schweitzer, EPA indicated that we were committed to spending time working cooperatively with the community to assure the cleanup will address the concerns of the local community of Superior and Mineral County.

- A June 16, 2010 letter from Mineral County Commissioners allowed additional time-critical contaminated soils to be temporarily placed with the existing time-critical removed soils that were placed on the Mineral County Airport in 2002. The letter also stated, "We understand that temporarily stored repository

materials will be removed but will be time dependent on the establishment of a permanent repository in the Flat Creek drainage." (a.k.a. Wood Gulch Repository)

Remedial Investigation:

- September 23, 2009 – NPL Listing: The Site was officially added to NPL.
- June 2009 – Remedial Investigation (RI - Phase I): EPA began an RI of the Site entailing an environmental screening of shallow soils in residential and commercial properties in OU1.
- January 2010 – Public Health Assessment Completed: The Agency for Toxic Substances Disease Registry (ATSDR) finalized its report entitled Public Health Assessment for Flat Creek/IMM (aka Superior Waste Rock), Superior, Mineral County, Montana.
- July to August 2009 – RI Phase II: MDEQ and EPA – Montana Office conducted sampling of 317 residential, commercial and public properties. Of those, 32 properties were identified for TCRA and cleaned up in 2010.
- April 2011 – Human Health Risk Assessment (HHRA): EPA completed a HHRA for OU1 in support of the RI.
- July to September 2010) - MDEQ and EPA (Montana Office) conducted sampling of additional 300 properties in and around Superior. There are five newly identified properties with concentrations of lead and arsenic greater than the health-based risk benchmarks, which is 3,000 ppm for lead and 400 ppm for arsenic.

Public Health Screening:

- February 2002 – Blood and Urine Testing – ATSDR and Mineral County Health collected blood lead and urine samples from individuals living in Superior to evaluate exposure to arsenic. No effects of exposure were found.
- January 2010 – Public Health Assessment Completed. The Agency for Toxic Substances Disease Registry (ATSDR) finalized its report entitled Public Health Assessment for Flat Creek IMM (aka Superior Waste Rock), Superior, Mineral County, Montana (Please see Attachment 3 – ATSDR Press Release).

3. Release or Threatened Release Into the Environment of a Hazardous Substance, Pollutant or Contaminant

(Please see Attachment 1 and 2).

4. NPL Status

On September 23, 2009, EPA formally added the Flat Creek/IMM Superfund Site to its National Priorities List (NPL) of Superfund sites.

B. Other Actions to Date

1. Previous Actions

August to November 2002 - EPA conducted a TCRA (OU1) [RV1] in Superior. Contaminated soil was removed from public and private properties, including the high school track, the fairgrounds and two residential properties. Approximately 6,500 cubic yards (yd^3) of the contaminated soil and mine tailings failed the TCLP analysis, were treated and placed into a repository cell located near the Mineral County Airport.

July to December 2010 - EPA began a second TCRA (OU1) [RV2]. This Removal Action was completed as follows:

- 32 properties cleaned by EPA.
- 1 property (RY 289) assessed by EPA, but remediated by USPS.
- 1 property (RY627 Northwestern Energy and Blackfoot Telephone Company) – Notice Letters of Contamination were sent to both companies on January 5, 2011.
- 1 property (RY317) – During the Phase II - Remediation Investigation conducted in 2010, XRF results show that the property was contaminated; however, the subsequent sampling by START 3 was unable to confinn the contamination for the same sampled area.

As of 01/14/2011, a total of 7,904 yd^3 of contaminated soil have been placed at the temporary staging area adjacent to the Mineral County Airport, including:

- Superior's Water Line Project	650 yd^3
- USPS Property Cleanup Located in Superior	370 yd^3
- Residential Properties Cleanup in Superior	6,884 yd^3

2. Current Actions

Wood Gulch Repository (OU3):

The Wood Gulch Repository is being developed in a cooperative effort between the EPA, state of Montana, USDA Forest Service, and Mineral County for pennanent disposal of mining related waste associated with the Flat Creek National Priorities List (NPL) Site. The EPA Removal Program has taken the lead on the design and construction of the Wood Gulch Repository.

MDEQ is currently working with Montana Department of Natural Resources (DNRC) to obtain access and titie to the Wood Gulch Repository so that the agencies (MDEQ, USPS and EPA) may collectively use that repository in implementing the response actions for the Site. An MOU is being drafted to provide the framework for the agencies to coordinate response actions and for each agency's proportionate share of response costs associated with repository, including O&M activities and costs of design, construction, expansion, etc.
A volume of 100,000 yd^3 of contained waste is the target volume for the Wood Gulch Repository design. The 100,000 yd^3 of waste is anticipated to be comprised of 30,000 yd^3 from EPA removal activities (OU1), 30,000 yd^3 from Montana DEQ

and US Forest Service sources (OU2), 10,000 yd^3 from Mineral County, and a 30,000 yd^3 safety factor in case some sources generate more than anticipated.

C. State and Local Authorities' Roles

MDEQ, USPS, ATSDR, Mineral County and the town of Superior are actively involved at this Site and have concurred with removal activities. MDEQ is actively involved at the Site, has been briefed and supports ongoing Removal Activities, including the design of the Wood Gulch Repository. MDEQ and USPS have assigned project managers who are fully engaged in the design and implementation of the sampling and the Removal Actions proposed herein.

Iii. THREATS TO PUBLIC HEALTH OR WELFARE OR THE ENVIRONMENT, AND STATUTORY AND REGULATORY AUTHORITIES

The threats posed at the six additional properties are the same as those identified in the TCRA Memorandum 2010 for (OU1)[RV2].

IV. ENDANGERMENT DETERMINATION

Actual or threatened releases of hazardous substances from this Site, if not addressed by the response action selected in this Action Memorandum, may present an imminent and substantial endangerment to public health, or welfare, or the environment.

V. EXEMPTION FROM STATUTORY LIMITS

Site conditions continue to meet the consistency exemption criteria specified in the request for an exemption from the 12-month and $2 million statutory limits set forth in the June 10, 2010 TCRA Memorandum.

VI. PROPOSED ACTIONS

A. Proposed Action Description

1. Proposed Action Description

Residential Cleanup: The cleanup action levels and the selected removal activities specified below are consistent with the August 2, 2002 TCRA (OU1)[RV1] Memorandum and June 10, 2010 TCRA (OU1)[RV2] Memorandum and future remedial actions.

The selected remedy for OU1 [RV3] is excavation of contaminated soils exceeding 3000 ppm of lead or 400 ppm of arsenic, on-site treatment of TCLP-failed soil, including mine tailings, and on-site disposal at the Wood Gulch Repository.

Lead concentrations at the remaining six properties range from 106 to 17,800 ppm and arsenic concentrations range from 91 to 737 ppm (RY146, RY257, RY523, RY600, RY402 and RY398). If additional properties are found to exceed the TCRA threshold, they will be added to the list of properties to be addressed during the course of this Removal action.

Wood Gulch Repository:

In general, a good repository design demands that the waste material remain isolated from the environment and have relatively minimal maintenance requirements. These fundamental requirements can be achieved by ensuring the repository is stable and design components are simple and robust. To be stable the repository must not be subject to slope failures due to embankment saturation or due to earthquake loading. The repository must be protected from flood Inundation and storm water erosion. Isolation of the wastes demands that the material be placed well above the water table, that storm water run-on be prevented, and that a sufficiently durable cap be provided. A vegetative cover derived from a seed mix using native species ensures a low maintenance cover. Drainage channels armored with riprap and a discharge culvert constructed using high density polyethylene pipe for road crossings provide a storm water drainage system which is simple and of low maintenance.

It is anticipated that the removal of mine waste from the various sources by this removal, EPA's remedial action, and the response actions of the USPS and MDEQ will occur over a period of several years. Conceptually, the repository has been divided into three cells in order to allow for efficient sequential addition of the mine waste and possible variation in the nature of waste from separate sources. The cell design is flexible in that the repository will be filled from the north progressing to the south, such that partial cells or multiple cells can easily be accommodated. Due to the nature of the Site, temporary stockpiles of topsoil and excavated clean subsoil need to be stored on the cells not being worked. Initially, all of the vegetation would be cleared so the cells not under active filling can be used for stockpiling and staging activities. It is the intent that the Site clearing, fencing, and installation of access roads and ditches for the entire cell would be performed during initial construction. Subsequent work (after EPA has filled Cell 1) would be limited to cell excavation, placing clean soil material in stockpiles, filling cells with mine waste, capping, and minor ditch adjustment. Weed control and vegetation monitoring would also be performed.

Construction requirements of the repository will consist of installation of environmental controls, Site preparation including clearing and stripping topsoil, establishment of perimeter roads, construction of drainage features, excavation of subsoil, placement of waste, capping, and establishment of vegetation.

Construction activities will be sequenced for efficiency. The following sequence is anticipated:

- Install warning signs along county road for traffic safety.
- Mobilize equipment to the Site.
- Set up pumping plant along Flat Creek to obtain water for dust control.
- Install silt fences for environmental protection.
- Survey for construction control and stakeout.
- Remove vegetation from the Site for recycling and landfill disposal, as appropriate.
- Strip topsoil and stockpile for reuse.

- Partially excavate Cell 1 repository area to obtain clean granular soil stockpile for screening to produce needed road gravel and ditch erosion control lining.
- Establish perimeter roads by grading and place gravel surfacing material.
- Install Site boundary fencing.
- Excavate drainage channels and install channel liners.
- Excavate a small sediment trap to control storm water run-off from clean disturbed areas.
- Excavate remainder of Cell 1 to produce stockpile of clean granular soil material.
- Transport mine waste to repository and place in thin lifts which are compacted by hauling equipment traffic.
- Perform final grading to shape repository cell and adjust drainage channels, if necessary.
- Install cap materials.
- Seed, fertilize, and mulch repository cap, drainage channels and stockpile areas.
- Demobilize equipment, and remove temporary road warning signs.
- In future years, repeat the last six steps as cells are added.

The repository is tentatively scheduled to be constructed in September 2011 and will be used to consolidate and receive mine waste containing hazardous substances brought there by MDEQ, USPS, and EPA resulting from response actions from OU1 and OU2, including 6,500 cubic yards of the contaminated soils currently stored at the Mineral County Airport. When the repository constmction is completed; subsequentiy, the EPA Remedial Program will transport all of the contaminated soils currentiy stored at the Mineral County Airport to the Wood Gulch Repository.

2. Contribution to Remedial Performance

The Removal Action will mitigate both current and potential health risks to children within residential portions of OU1. The cleanup actions are consistent with past and planned future remedial actions for OU1.

3. Description of Alternative Technologies

EPA will use the soil treatment option for soils that was successfully used during the 2010 TCRA. Soils exceeding 5 mg/L extractable lead were successfully treated with 2 – 3% of TSP (phosphate compound).

4. Engineering Evaluation/Cost Analysis (EE/CA)

This is a Time-Critical Removal Action; thus, and EE/CA is not required for alternative actions.

5. Applicable or Relevant and Appropriate Requirements (ARARs)

Since this action is being conducted as a Time-Critical Removal Action, all federal and state ARARs may not have been identified at this time. This Removal Action will attain, to the extent practicable, and considering the exigencies of the situation, all applicable or relevant and appropriate (ARAR) federal, state or local

standards, criteria or regulations. The ARARs identified to date are the same as those identified in the TCRA June 10, 2010.

6. Project Schedule

Removal activities and repository construction are tentatively scheduled to begin in September 2011. Completion of restoration and monitoring of landscape restoration may continue into the spring of 2012.

B. ESTIMATED COSTS

Reajonal Allowance Costs	Emergency and Rapid Response Services (ERRS): *Residential Cleanup:* • Excavation and Restoration • Preparation of Treatment/Staging Facility • Transportation and Disposal *Repository Construction:*	 $800,000 $100,000 $300,000	 $200,000 $300,000
	Subtotal A)	$1,200,000	$500,000
	START *Residential Clean-up:* • Sampling, Analytical, Design, Surveying • Treatability Study • Geotechnical Study (Repository) *Repository (Groundwater Investigation):*	 $250,000 $50,000 $100,000	 $100,000
	Subtotal B	$400,000	$100,000
Other Extramural Costs	*Bureau of Reclamation (BOR)* • *Repository Design & Construction Oversight*		$150,000
	Subtotal		$150,000
	Total (A + B)	$1,600,000	$750,000
20% Extramural Costs Contingency		$320,000	$150,000

	Total Extramural Costs	(1) $1,920,000	(2) $900,000

(1) The total ceiling for 2010 TCRA was $1,920,000; however, $1,400,000 was partially funded. The remaining $520,000 will be used for the 2011 Removal Action.
(2) $900,000 is projected to construct the Wood Gulch Repository and to complete the Removal Action for five newly identified properties in Superior, MT.

TOTAL REMOVAL ACTION PROPOSED CEILING $ 2,300,000

VII. EXPECTED CHANGE IN THE SITUATION SHOULD ACTION BE DELAYED OR NOT TAKEN

If no Removal Action is taken for the remaining six residential properties, or the requested ceiling increase is not provided, or if the repository construction is delayed, the residents in and around Superior will continue to be exposed to high levels of lead and arsenic, including 8,000 cubic yards of contaminated soil temporarily staged at the Mineral County Airport in Superior.

VIII. OUTSTANDING POLICY ISSUES

It is important to note that the Mineral County Commissioners and the town of Superior have requested since 2002 that all the wastes should be consolidated into a single and pennanent repository as soon as the construction of Wood Gulch Repository is completed.

IX. ENFORCEMENT

Current and potential future enforcement actions and other enforcement considerations are the same as those set out in the Enforcement Addendum attached to the June 6, 2010 Action Memorandum for this Site.

The total EPA costs for this Removal Action, based on full-cost accounting practices that will be eligible for cost recovery are estimated at:

REMOVAL PROJECT CEILING	$2,300,000
EPA's Direct Intramural Costs	$ 200,000
Subtotal	$2,500,000
Regional Indirect Costs, 35% (*)	$ 875,000
Estimated EPA Costs for the Removal Action	$3,375,000

(*) Direct Costs include direct extramural costs and direct intramural costs. indirect costs are calculated based on an estimated indirect cost rate expressed as a percentage of site-specific direct costs, consistent with the full cost accounting methodology effective October 2, 2000. These estimates do not include pre-judgment interest, do not take into account other enforcement costs, including Department of Justice costs, and may be adjusted during the course of the Removal Action. The estimates are for illustrative purposes only and their use is not intended to create any rights for responsible parties. Neither the lack of total costs estimates nor deviation of actual costs from this estimate will affect the United States' right to cost recovery.

X. RECOMMENDATION

This decision document describes the selected Time-Critical Removal Action for the Residential Operable Unit (OU1) [RV3] of the Flat Creek/IMM NPL Site located near and in the town of Superior, Mineral County, Montana, developed in accordance with CERCLA, as amended, and not inconsistent with the NCP. This decision is based on the administrative record for the Site.

Conditions at the Site meet the NCP §300.415 (b) (2) criteria for a removal, and I recommend your approval of the proposed Time-Critical Removal Action. The total removal ceiling, if approved, is expected to be **$3,375,000.**

Approve: Carol L Campbell Date: 9/27/11

Carol L. Campbell
Assistant Regional Administrator
Office of Ecosystems Protection and Remediation

Disapprove:_____ Date:_____

Carol L. Campbell
Assistant Regional Administrator
Office of Ecosystems Protection and Remediation

Attachments:

Attachment 1:	Time-Critical Removal Action Memorandum (OU1)[RV1] - August 2, 2002
Attachment 2:	Time-Critical Removal Action Memorandum (OU1)[RV2] - June 10, 2010
Attachment 3:	ATSDR – Press Release
Figure 1:	Flat Creek/IMM NPL Site Location Map
Figure 2:	Operable Unit 1 (OU1) - Properties of Concern
Figure 3:	Wood Gulch Repository Design
Table 1:	Sample Results

SUPPLEMENTAL DOCUMENTS

Support/reference documents that may be helpful to the reader and/or have been cited in the report may be found in the Administrative Record File at the Superfund Records Center for Region VIII EPA – Montana Office, 10 West 15th Street, Suite 3200 in Helena, Montana. EPA has also provided a local source of information on the second floor of the Mineral County Courthouse, 300 River Street, Superior, Montana.

Attachment 1

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Ref: 8EPR-ER

AUG - 2 2002

ACTION MEMORANDUM

SUBJECT: Documentation of a Time-Critical Removal Action at Superior Waste Rock Site near and in the town of Superior in Mineral County, Montana.

FROM: Tien Nguyen, On-Scene Coordinator
Emergency Response Team

THROUGH: Steve Hawthorn, Supervisor
Emergency Response Unit

Doug Skie, Director
Office of Preparedness, Assessment, and Emergency Response

TO: Max Dodson, Assistant Regional Administrator
Office of Ecosystems Protection and Remediation

Site ID#: 08ER

Category of Removal: Time-Critical, Fund-Lead

I. PURPOSE

The purpose of this Action Memorandum is to request and document approval of an initial Removal Action with an Emergency Exemption from the 12-month statutory limits for the Removal Action described herein for the Superior Waste Rock site (Site) located in and around the town of Superior in Mineral County, Montana. The Removal Action will involve excavation of soils containing elevated levels of lead, arsenic, and other metals from designated properties within the Site that have been contaminated by mining/mill waste.

As discussed further in this Action Memo, the logistical constraints of the short construction season and needed searching for alternative treatment/disposal options dictate that response actions be prioritized and conducted in phases. The Removal Action, described herein, will be consistent with any future Remedial Acdons which may be taken.

II. SITE CONDITIONS AND BACKGROUND

A. Site Description

1. Removal site evaluation

The CERCLIS ID number of the Site is MTD0012694970 and conditions are such that this Removal Action is classified as Time-Critical. The Site includes the town of Superior, Montana, and adjacent lands (See Attachment 1 - Site Locadon Map).

On October 16-18, 2001, Region VIII EPA conducted a PA/SI at the Site and collected 44 enviromnental samples from the area, including 11 samples within the Town ofiSuperior. (See Attachment 2 - A summary of samples results [samples IM-SO-09 to IM-SO-I4]- Excerpt from Analytical Results Report for Focused Site Inspection, URS Operating Services, 1/24/02). These eleven soil samples were collected from the high school track and residential properties in Superior. Most of the samples had concentrations of several analytes at least three times above the background sample - specifically, antimony had concentradons ranging from 34.4 parts per million (ppm) to 1,050 ppm, arsenic ranging from 79.4 to 1,690 ppm, lead from 423 ppm to 8,500, and mercury from 0.32 to 12.4 ppm. The background soil sample contained arsenic at 3.9 ppm and lead at 6 ppm. During sampling activities at the Town of Superior, it was observed that the main source of contamination is mine tailings, reddish materials, which were bought to the Town of Superior as fill. Therefore, the potential targets for the surface soil contamination are local residents where the elevated metals are located and the Superior High School track where the 383 elementary and high school students attend school in the Superior School District. The thickness of this fill ranges between 2 to 4 inches at the residential areas and 6 to 8 inches at the high school track, and the total volume of tailings and contaminated soils is estimated to be about 5,300 cubic yards.

On January 23, 2002, the Montana Department of Environmental Quality (MDEQ) requested EPA to evaluate the Superior High School track, Superior residential properties, and the Iron Mountain Mine/Mill site for a possible removal action (See Attachment 3 - Letter from MDEQ dated 1/23/02). From the results, a Site Sampling Plan has been developed and from June 4 to 12, 2002 the EPA Region VIII Removal Program tasked START2 Contractor to collect surface and sub-surface soil samples for XRF on-site screening. A total of more than 650 samples were collected from nearly 100 residential properties, who had signed an Access On Consent with EPA, and twelve separate areas, including right-of-ways and Town/County properties within and around Superior, which were identified as potential contaminated areas by the Mineral County Health and the Superior's Public Work personnel.

Preliminary XRF results show that nine residential properties, three Town/County properties (the High School track, the County fairground, and the Town shop) and five right-of-way locations have elevated levels of lead and arsenic contamination. These levels are ranging from 500 ppm to 11,000 ppm for lead or from 100 ppm to 1,700 ppm for arsenic (See Attachment 4 - Superior Waste Rock/ Estimated Volume of Contaminated Material, by URS dated July 2, 2002).

Ten percent of these XRF soil samples had been sent to the labs for analytical confirmation. Four of these samples were also run for Toxicity Characteristics Leaching Procedures (TCLP). On July 9, 2002, the preliminary sampling results indicate that afl four samples failed TCLP for lead. Theses results range from 36 mg/l to 140 mg/l (See Attachment 5); the regulatory standard for lead is 5 mg/l. The four samples were collected from the high school tract, the County fairground, the house at 201 Spruce (along the fence line), and the house at 208 Main street (the forest service house).

2. Physical location and site characteristics

The Site covers the town of Superior, in Mineral County, Montana, where tailings reportedly have been used as a fill surface soil and contamination exists at local residences and the Superior High School track. (A map of the Site area is included in Attachment I). The Site is located down stream from the Flat Creek drainage, along the banks of the Clark Fork River, and approximately 3.5 miles south of the Iron Mountain Mine and Mill. The waste rock/tailings reportedly are from the Iron Mountain Mine and Mill which is 3.5 miles North of the Town of Superior.

3. Release or threatened release into the environment of a hazardous substance, or pollutant or contamlnant

Arsenic and lead have been identified as the contaminants posing the greatest risk and hazard; however, other metals, including antimony, cadmium, copper, iron, manganese, mercury, silver, and zinc have levels ofi concentrations at over three rimes the level of background samples. These metals are hazardous substances, as defined by Section 101 (14) of CERCLA. The tiireats posed by this Site include dermal absorption; ingestion of potentially contaminated plants and fish; and the inadvertent ingestion of contaminated soil and surface waten

Below are briefi summaries of the toxicological effects of lead and arsenic:

Lead

Lead is classified as a B2 carcinogen by EPA. This classification is die result of adequate animal studies determining that these compounds are probable human

carcinogens. Lead can enter the body via ingestion and inhalation. Children appear to be the segment of the population at greatest risk from toxic effects of lead. Initially, lead travels in the blood to the soft tissues (heart, liver, kidney, brain, etc.), then it gradually redistributes to the bones and teeth where it tends to remain. Children exposed to high levels of lead have exhibited nerve damage, permanent mental retardation, colic, anemia, brain damage, and death.

Arsenic

Arsenic is a confirmed human carcinogen, producing tumors in the liver and renal system. It is also poisonous by subcutaneous, intramuscular, and intraperitoneal routes. At lower doses ingestion will induce adverse systemic skin and gastrointestinal effects. It is also classified as an experimental teratogen. Inorganic forms of arsenic are more toxic than organic forms in both acute and chronic exposures.

4. NPL statns

This Site is not an NPL site nor is it proposed to be on the list.

5. Maps and Illustrations

A Site map and sampling analyses are included in Attachments 1, 2, 4 and 5 .

B. Other Actions to Date

1. Previous actions

EPA has not taken other actions at this Site that have not already been discussed in this Action Memorandum.

2. Current actions

After receiving the preliminary XRF and TCLP sampling results, and being aware of the logistical constraints of the short construction season in Montana, the OSC determined that immediate Removal Action should occur, but the work needed to be staged in order of priority. Since the level of readings were especially high at the Superior High School track and since school sessions will be discontinued until September of 2002, it bas been determined that cleanup actions at the high school track should be the first priority and begin this summer. The cleanup actions at private properties, right-of-ways, and city/county property authorized by this Action Memorandum will be conducted at a later date.

C. State and Local Authorities' Roles

1. State and local actions to date

As a result of concern expressed by the community, the threats posed at the Superior Waste Rock Site and the inability of the State to fund removal of the potentially hazardous materials, the State requested assistance from EPA in undertaking a Removal Action (See Attachment 2 - 1/23/02 MDEQ Letter). Staff members from MDEQ are working with EPA on a continuing basis, and MDEQ will continue to be informed and involved.

2. Potential for continued State/local response

Neither the State nor local authorities have the resources to conduct a Removal Action at this time. The State and local constituents will continue to be involved in the investigation/assessment of the Site and will be kept apprised of all activities of this Removal Action.

III. THREATS TO PUBLIC HEALTH OR WELFARE OR THE ENVIRONMENT, AND STATUTORY AND REGULATORY AUTHORITIES

A. Threats to Public Health or Welfare

The potential threat of direct exposure exists through the inhalation and ingestion of lead, arsenic, and other metals. The high concentrations of lead, arsenic, and other metals found at the Site may have toxic effects on the exposed human and animal populations. These include neurological effects and chronic liver and kidney disease (see discussion in Section II.A.4).

Due to the high concentrations of metals found in the soils and fill, conditions at the Site present an imminent and substantial endangerment to human health and the environment and meet the criteria for initiating a Removal Action under 40 CFR Section 300.415 (b)(2) of the NCP. The following factors from § 300.415 (b)(2) of the NCP form the basis for EPA's determination of the threat presented and the appropriate action to be taken:

(i) Actual or potential exposure to nearby human populations, animals, or the food chain from hazardous substances or pollutants or contaminants;

(iv) High levels of hazardous substances or pollutants or contaminants in soils largely at or near the surface, that may migrate;

(v) Weather conditions that may cause hazardous substances or pollutants or contaminants to migrate or be released; and,

(vii) The unavailability of other appropriate federal or state response mechanisms to respond to the release.

B. Threats to the Environment

EPA has not determined at this time whether a threat to the environment exists through the migration of and airborne exposure to the contaminated particles and dust. On dry windy days, the dust and particles may migrate to the surface waters, wetlands, agricultural land, and habitats as they become airborne. The Town of Superior is located along the banks of the Clark Fork River which has a population of rainbow, brook, and cutthroat trout. Additional potential targets within Mineral County include federally listed threatened and endangered species which include the bald eagle, gray wolf, bull trout, and Canadian lynx.

Arsenic may bioaccumulate in aquatic organisms. Arsenic bioaccumulates primarily in algae and lower invertebrates. The embryonic and larval stages of aquatic animals are generally the most sensitive and sediment-feeding organisms will contain higher metal concentration than other organisms.

Lead is ubiquitous in the environment and although bioaccumulation is known to occur, and lead is found in the tissue of many wild animals, including birds, mammals, fishes, and invertebrates, the most publicized effects of lead have been on the impact of ingestion of lead by waterfowl. Acute and chronic lead toxicity have been demonstrated as a definite threat to bird populations. There is also evidence that lead at high concentrations can eliminate populations of bacteria and fungi on leaf surfaces and in soil. Many of the microorganisms play key roles in the decomposer food chain.

IV. ENDANGERMENT DETERMINATION

Actual or threatened releases of hazardous substances from this Site, if not addressed by implementing the response action identified in this Action Memorandum, may present an imminent and substantial endangerment to public health or welfare, or the environment.

V. EXEMPTION FROM STATUTORY LIMITS

A. Emergency Exemption:

1. Site conditions meet the criteria set forth in CERCLA Section 104(c)(1)(A). There is an immediate risk to public health, welfare or the environment. Lead and arsenic are the primary contaminants of concern. The potential threat of direct exposure exists through the inhalation and ingestion of airborne particles and dust. The Site includes properties with elevated lead and arsenic concentrations. These properties are readily accessible to all populations, but the population at highest risk on the Site, and the most exposed because of

their activities, are children. High concentrations of lead and arsenic are found in and around the residential properties and play area; and, with the onset of the school year, outdoor activities of children will increase, resulting in increased exposure to high concentrations of contaminated soil on a continuing basis.

Children are also the segment of the population at greatest risk from the toxic effects of contaminants because their developing organ systems are intrinsically more sensitive to the effects; their behavioral characteristics (e.g. mouthing behavior and pica) increase contact with dust and soil; and because children absorb lead from the gastrointestinal tract with greater efficiency than adults.

2. Continued response actions are immediately required to prevent, limit, or mitigate an emergency. If the request for a 12-month statutory exemption is not granted, children, as well as adults living in private properties on the Site, will continue to be exposed to potentially dangerous levels of lead/arsenic. This Removal is intended to reduce overall exposure to acceptable levels.

3. Assistance from other local government agencies is not anticipated on a timely basis. Mineral County, the Town of Superior, and the State of Montana lack the response capabilities to take any actions at the Site. Clearly, the timely completion of this Removal Action can only be accomplished if this statutory exemption request is approved.

VI. PROPOSED ACTIONS AND ESTIMATED COSTS

A. Proposed Actions

1. Proposed action description

The following proposed actions are based on the need to provide immediate reduction in exposure to lead and arsenic from tailings and contaminated soils:

a. Mine tailings at the high school track, the county fairground, along the fence line at 201 Spruce Street, and the driveway at 208 Main Street, failed TCLP and will be excavated and staged in bulk for purposes of disposal. EPA will evaluate alternative treatment and disposal options based on the TCLP test results and the volume of the hazardous waste before an appropriate treatment/disposal option is selected. The mine tailings are wastes resulting from the beneficiation process and as a result are exempt from regulation under Subtitle C of the Resource Conservation and Recovery Act (RCRA).

b. The remaining contaminated soils and mine tailings located in other areas, including residential properties and the right-of-ways will be included in the Removal Action if

die average surface soil concentration exceeds 3,000 mg/kg of lead or 400 mg/kg of arsenic. The soil will be removed to a maximum depth of 12", except for vegetable gardens - which will be removed to a maximum of 24". The excavated soils and mine tailings described in this paragraph will be staged and sampled for TCLP analysis. As was the case with the mine tailings described in paragraph (a), the contaminated soil and mine tailings described in this paragraph are wastes resulting from the beneficiation process and as a result are exempt from regulation under Subtitle C of RCRA.

c. The excavated areas, including the high school track, the county fairground, and the right-of-ways will be backfilled using materials comparable with existing materials or a combination of cleaned, compacted gravel and 4" of asphalt on the surface.

d. Individual residences where soil is removed will be backfilled with clean soil and top soil to the original grade and/or landscaped similar to the original condition.

e. In the areas where a removal is not feasible, capping with 12" gravel or 4" asphalt may be considered if the following conditions are met: (1) a removal is not feasible (e.g., a lot with many large trees that the homeowner does not want removed); (2) there is relative certainty that the land use will not change in the short term (e.g. the cap will not be disturbed); and (3) drainage will not be adversely affected.

This Removal Action also includes the following specific considerations:

- Structures and fencing on the properties will be left in place or returned to their original locations if removal is necessary. If fencing cannot be reused, it will be replaced.
- Existing Shrubs and/or Bushes(defined as low, densely branched plants that impede soil removal): Removal and replacement with the same species, standard nursery stock, and number of plants.
- Existing Perennial Plants: Removal and replacement with the same (to the extent possible) or similar species, approximate size, and number of plants.
- Annual Plants: Removal with no replacement.
- Existing Sprinkler Systems: If the existing system impedes soil removal or will not function after barrier soil is placed, removal and replacement with the same or similar system.
- Existing Concrete, Asphalt, Brick Stone, or Tile Surfacing (sidewalks, driveways, parking lots, pads): Remain in place and excavate around unless the existing surfacing has been damaged in the past to the extent that soils exceeding the action levels are exposed. If soils exceeding the action levels have been exposed, remove and replace the surfacing with equivalent materials, if necessary to prevent exposure.
- Existing Landscape Covers and Borders: Removal and replacement with equivalent materials in areas requiring removal. The original materials may also be used if soil is removed before replacement and materials are not damaged during removal.

- Outdoor Animals: Temporary relocation during removal of individual properties located in areas requiring removal.
- Movable Buildings and Sheds: Temporary relocation during removal, if removal is necessary at that location.
- Existing Vegetable Gardens Exceeding Action Levels: Removal of a maximum of 24 inches of soil; replacement with a minimum of, but not necessarily more than, 24 inches of suitable vegetable garden soil with characteristics acceptable to EPA. Suitable vegetable garden soil will consist of clayey or sandy loam soils having a specified minimum percentage of organic matter. Suitable grades and ground cover will be restored.
- Prevention of Indoor Dust: Dust suppression measures will be utilized during Removal. If necessary, other measures, such as sealing of doors and windows with plastic, will be taken during removal of individual properties. If necessary, portable air cooling devices will be offered to residents during this time period.
- Existing Decks: Remain in place and excavate beneath and around as needed unless the existing deck impedes soil removal.

Owners will be asked for permission for the removal at their residential areas. Detailed plans will be developed for the properties which are undergoing removal, and owners will be provided copies and an opportunity to discuss the plans.

2. Contribution to remedial performance

The Removal Action proposed by EPA for this Site is consistent with any potential long-term plans of the Remedial Program.

3. Description of alternative technologies

As previously discussed, a large volume of contaminated soils/tailings failed the TCLP analysis, and are therefore considered as a RCRA hazardous waste. However, the contaminated soils and mine tailings are wastes resulting from the beneficiation process and as a result are exempt from regulation under Subtitle C of RCRA. EPA has adopted a flexible approach for this Removal Action, based on site-specific circumstances. Alternative approaches, such as on-site treatment prior to final disposal will be implemented where appropriate. The decision will be made based on whether alternative technologies are practical or cost effective to achieve the Removal Action objectives.

4. EE/CA

This is a Time-Critical Removal Action; thus, an EE/CA is not required.

5. Applicable or relevant and appropriate requirements (ARARs)

This Removal Action will attain, to the extent practicable, considering the exigencies

of the situation, applicable or relevant and appropriate requirements (ARARs) of Federal environmental or more stringent State environmental or facility-siting laws. Following is a list of ARARs that have been identified to date for this Removal Action:

FEDERAL ARARS

a. Clean Water Act (33 USC Sections 1341 and 1344).
b. Clean Water Act (40 CFR Part 230).
c. Resource Conservation and Recovery Act (RCRA), Subtitle C (capping and placement requirements may be relevant and appropriate), and Subtitle D (solid waste disposal requirements are applicable).
d. RCRA Standards for CAMUs, and TUs (40 CFR 264.552 & .553) and Staging Piles (40 CFR 264.554) are applicable.
e DOT Hazardous Material Transportation Regulations (49 CFR Parts 107, 171-177).

STATE ARARS

a. Montana Metal Mine Reclamation Act is relevant and appropriate.
b. Montana Water Quality Standards are relevant and appropriate.
c. Montana Comprehensive Environmental Cleanup and Responsibility Act is relevant and appropriate.

6. Project schedule

Due to construction season constraints the project is tentatively planned in two phases:

Phase I:	
Site Mobilization:	August, 2002
Tailings/Soils Excavation and Staging and Secured:	August to October, 2002
Backfilling and Restoration Excavated Areas:	September to November, 2002
Alternative Treatment Options Proposal:	October to November, 2002
Phase II:	
On-Site/Off-Site Treatment and Disposal:	December, 2002 to Spring, 2003
Site Final Restoration:	June, 2003
Demobilization:	June, 2003

B. Estimated Costs

Cost Estimate: A table containing cost estimates for the Removal project ceiling is shown below.

Extramural Costs:	
Regional Allowance Costs	
Emergency and Rapid Response Services (ERRS) Cost	$ 100,000
Tailings/Soil Excavation and Staging	$ 100,000
Detailed Residential Removal Planning and Alternative Treatment Options	$ 50,000
Waste On/Off-Site Treatment and Disposal	$ 100,000
Backfilling and Restoration	$ 120,000
Total Cleanup Contractor Costs	$ 470,000
Other Extramural Costs Not Funded From The Regional Allowance:	
Total START costs	$ 40,000
Total Analytical Contract	$ 15,000
	$ 55,000
Subtotal, Extramural Costs	$ 525,000
20% Extramural Costs Contingency	$ 105,000
TOTAL, EXTRAMURAL COSTS	$ 630,000

The estimated total Extramural Costs for the project is $630,000. Based on the tasks and project schedule, the Extramural costs for Phase I are estimated to be $350,000 and Phase II to be $280,000.

The total EPA costs for this removal action based on full-cost accounting practices that will be eligible for cost recovery are estimated at:

Total Removal Ceiling	$ 630,000
EPA's Direct Intramural Costs	$ 100,000
Subtotal	$ 730,000
Regional Indirect Cost (27%)	$ 197,100
Estimated Total EPA Costs	$ 927,100

Direct Costs include direct extramural costs and direct intramural costs. Indirect costs are calculated based on an estimated indirect cost rate expressed as a percentage of site-specific direct costs, consistent with the full cost accounting methodology effective October 2, 2000. These estimates do not include pre-judgement interest, do not take into account other enforcement costs, including Department of Justice costs, and may be adjusted during the course of the removal action.

The estimates are for illustrative purposes only and their use is not intended to create any rights for responsible parties. Neither the lack of total costs estimates nor deviation of actual costs from this estimate will affect the United States' right to cost recovery.

VIL ENFORCEMENT

See Enforcement Addendum (Attachment 6).

VIIL EXPECTED CHANGE IN THE SITUATION SHOULD ACTION BE DELAYED OR NOT TAKEN

Delayed or no action will increase public health risks and threats to the environment because the hazardous substances on-site pose a health risk to children or adults who live near the Site, as well as the wildlife in the area.

IX. OUTSTANDING POLICY ISSUES

None.

X. RECOMMENDATION

This decision document represents the selected Removal Action for the Superior Waste Rock Site near and in the town of Superior in Mineral County, Montana, developed in accordance with CERCLA, as amended, and consistent with the NCP. This decision is based on the Administrative Record for the Site.

Conditions at the Site meet the NCP Section 300.415(b)(2) criteria for a Removal, and I recommend your approval of the proposed Removal Action. The total project ceiling if approved will be $927,100. Of the total ceiling, an estimated $630,000 (Phase I: $350,000 and Phase II: $280,000) comes from the Regional removal allowance.

Approve: _____ Date: 8/2/02

Max H. Dodson, Assistant Regional Administrator
Office of Ecosystems Protection and Remediation

Disapprove: _____ Date: _____

Max H. Dodson, Assistant Regional Administrator
Office of Ecosystems Protection and Remediation

Attachments:

Attachment 1	-	Site Location Map
Attachment 2	-	Sample Results Summary, Analytical Results Report for Focused Site Inspection, URS Operating Services, 1/24/02
Attachment 3	-	Letters from MO and MDEQ dated 1/23/02
Attachment 4	-	XRF Sample Results and Estimated Volume of Contaminated Soil
Attachment 5	-	TCLP Test Results
Attachment 6	-	Enforcement Addendum

SUPPLEMENTAL DOCUMENTS

Support/reference documents which may be helpful to the reader and/or have been cited in the report may be found in the Administrative Record at the Superfund Records Center for Region VIII EPA, 999 18th Street, Suite 300, Denver, Colorado 80202.

Poor Quality Source Document

The following document images have been scanned from the best available source copy.

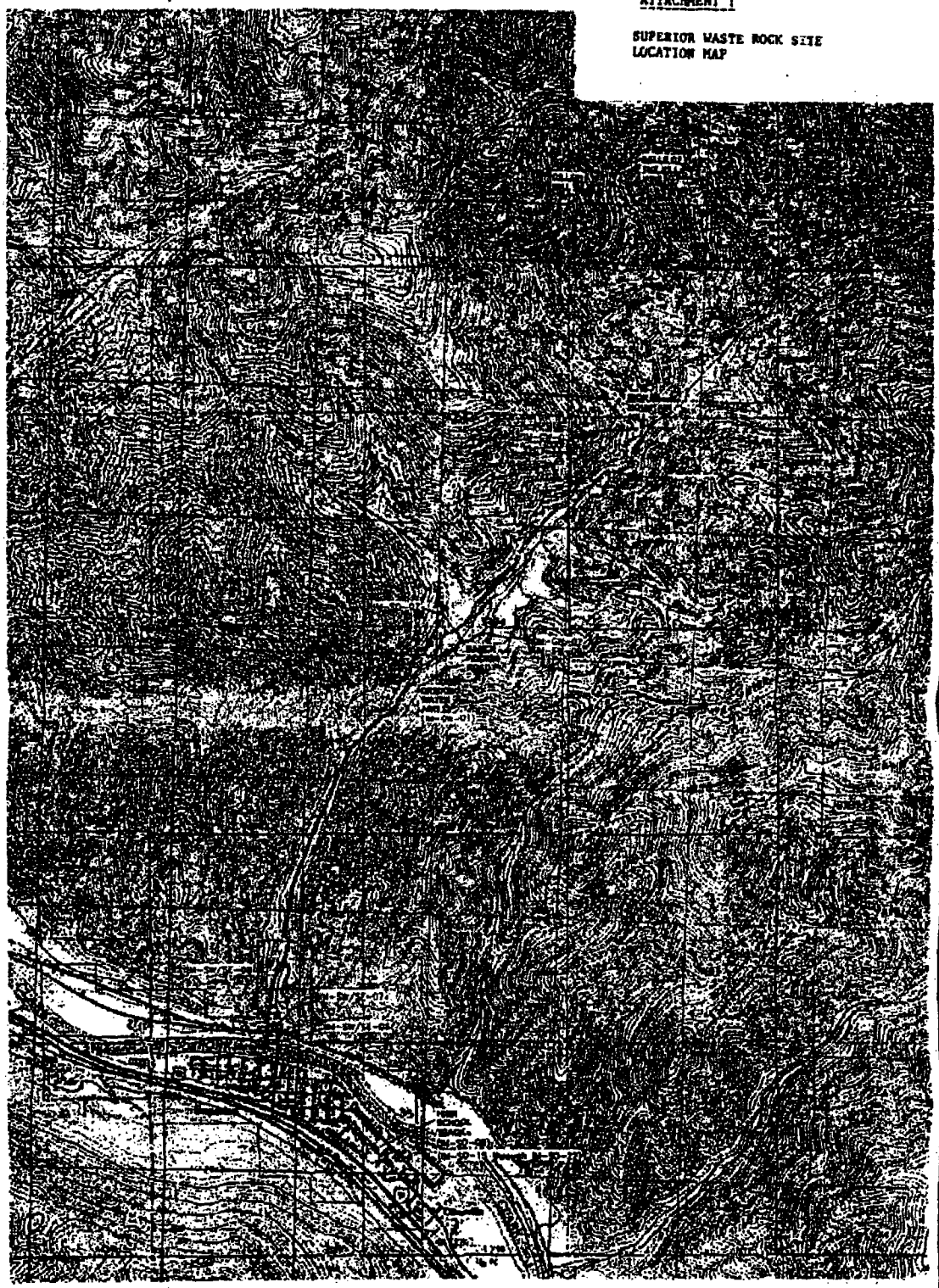
To view the actual hard copy, contact the Superfund Records Center at (303) 312-6473.

DATE: 09/05/01 REV (TEXT) FILENAME: H:/DRAWINGS/IRON MOUNTAIN MILL/FSP/SMPLMAP.DWG

URS Operating Services
START, EPA Region VIII
Contract No. 68-W-00-118

ATTACHMENT 1

SUPERIOR WASTE ROCK SITE
LOCATION MAP



SOURCE: USGS QUADRANGLES
KEYSTONE PEAK, MONTANA
QUIGG HOT SPRINGS, MONTANA
SUPERIOR, MONTANA
IDAHO GULCH, MONTANA
ALL - PROVISIONAL EDITION 1986

2400 0 2400
SCALE: 1" = 2400'

Field Sampling Plan
URS Job No. 75-10105.00

Iron Mountain Mill
Superior, Mineral County, Montana
Sample Location Map
Figure

September 2001

URS

75-10105.00
D:\START\Iron Mountain\Draft\SPA\FSP Text.wpd

ATTACHMENT 2

IM-SO-09	Background sample from park on west side of Superior	<1.0	3.8	<2.0	8.0	<.04
IM-SO-06	Surface sample (0-S") from high school track	46.9	101	3.6	S82	0.35
IM-SO-15	Surface sample (0-3") from high school track	559	1,340	20	S,1S0	3.4
IM-SO-16	Surface sample (0-3") from high school track	587	1,690	28.5	4,950	1.3
IM-SO-17	Surface sample (0-3") from high school track	221	436	16	1,910	1.0
IM-SO-18	Surface sample (0-3") from high school track	132	279	5.5	1,550	.52
IM-SO-18	Surface sample (0-3") from high school track	847	1,200	18.1	6,820	4.8
IM-SO-21	Sample bom 12-24" from sample location IM-SO-16	166	464	9.8	1,800	1.0
IM-SO-22	Sample from 12-24" from sample location IM-SO-18	1,050	1,380	43.9	8,500	12.4
IM-SO-13	Residential FS property at 208 Main Material would not maintain vegetative growth and was slighily discolorwi with a reddish tint. DM not readily appear to be tailings.	1,250	1,570	42	11,300	0.9
Im-SO-14	Right-of-way at corner of Third Ave and Sprues St. Material orange in color and 6" above grade.	972	1,640	10.8	7,930	5.7

Attachment 2

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 8
1595 Wynkoop Street
DENVER, CO 80202-1129
Phone 800-227-8917
http://www.epa.gov/region08

Ref: EPR-SA

ACTION MEMORANDUM

SUBJECT: Request for Time-Critical Removal Action at the Flat Creek/Iron Mountain Mine and Mill (IMM) NPL Site – Residential Operable Unit 1 (OU1) [RV2] located in and around the town of Superior, Mineral County, Montana.

FROM: Due Nguyen, On-Scene Coordinator (OSC) Curtis J. Kimbel for
Response Unit

THROUGH: Curtis Kimbel, Supervisor Curtis J Kimbel
Response Unit

THROUGH: David Ostrander, Director DO-OAC
Preparedness, Assessment & Response Program

TO: Carol L. Campbell, Assistant Regional Administrator
Office of Ecosystems Protection and Remediation

Site ID#:	08ER
CERCLIS ID#:	MT0012694970
Category of Removal:	Time Critical, Fund-Lead

I. PURPOSE

The purpose of this Action Memorandum is to request and document approval of a combined Time-Critical Removal Action (TCRA) and an exemption from the 12-month and $2 million statutory limits for the proposed Time-Critical Removal Action described herein for the Flat Creek/IMM NPL – Residential Operable Unit (OU1) [RV2] (the 'Site') located in and around the Town of Superior, Montana. This TCRA will continue to mitigate the threats to the local population and environment, and will consist of: 1) excavation for on-site treatment and/or off-site disposal of soils containing elevated levels of lead and arsenic from 31 residential/commercial/public properties; and 2) design and construction of a mine waste repository. The conditions at this Site meet the emergency criteria for exemption from the statutory limits for a Removal Action.

In accordance with National Contingency Plan (NCP), Section 300.415(b)(2), this Removal Action will address: 1) actual or potential exposure of human populations to hazardous substances, pollutants, or contaminants; and 2) high levels of hazardous substances or pollutants or contaminants in soils largely at or near the surface, that may migrate.

Between 08/03/09 – 09/25/09, Montana Department of Environmental Quality (MDEQ) and EPA conducted Remedial Investigation (RI) Phase I sampling of 300 targeted residential, commercial, and

public Site properties. This proposed TCRA will address the most-immediate threats as identified during that Phase I sampling event. RI Phase II sampling will be conducted on an additional 250 properties in the summer 2010. If additional properties are found to exceed the TCRA threshold, they will be added to the list of properties to be addressed during the course of this Removal action. Documentation of such additions will include, in part, future Amendments to this Action Memorandum. The Removal Action described herein is consistent with any future Remedial Actions which may be taken at the Site.

II. SITE CONDITIONS AND BACKGROUND

The Flat Creek/IMM Site (CERCLIS ID No. MT0012694970) was added to the EPA National Priorities List (NPL) of Superfund Sites on September 23, 2009. Site contamination resulted from historic hard rock mining and milling operations in the area. The IMM operated from 1909-1930 and from 1947-1953 processing silver, gold, lead, copper, and zinc ores. The Site is generally subdivided into three Operable Units ('OU'): OU1 - the residential, commercial, and municipal properties and roadways in and around the Town of Superior; OU2 - the rest of the Site (mine, floodplain, streambed, etc.); and OU3 - a repository (to be constructed) to hold the excavated waste rock and mine tailings associated with OU1 and OU2 (approximately 75,000 cubic yards of waste).

The Flat Creek/IMM NPL Site is located partially on private land and partially on Forest Service Lands within and adjacent to the established boundaries of the Lolo National Forest. In addition, some Site areas are the property of the Town of Superior and some of Mineral County. The Forest Service Lands portion of the Site is administered by the Lolo National Forest, Superior District.

Due to historic mining activities in the area, waste rock and tailings containing hazardous substances came to be located in various Site locations. Some Site areas between the mouth of Flat Creek and the Creek confluence with the Clark Fork River were formerly owned by ASARCO, some areas are currently owned by the Stimson Lumber Company, Lolo National Forest, and the Town of Superior.

Portions of the Site were the subject of ASARCO Bankruptcy Proceedings. Pursuant to those Proceedings, the Montana Environmental Custodial Trust received a settlement of $1.864 Million for clean-up of the former ASARCO-owned properties (along with the title to these properties). In addition, the State of Montana (MDEQ) received approximately $1.9 Million and the Forest Service received approximately $585,000 for the clean-up of the 'unowned' portion of the Site. In general, the Montana Environmental Custody Trust, the MDEQ, and the USES are responding agencies for the clean-up of OU02.

Neither the Custodial Trust, State, or Forest Service settlements within the ASARCO Bankruptcy Proceedings, nor the work to be performed under those settlements, will address the release or threat of release of hazardous substances within or near the Town of Superior, including response actions that may be needed on any property owned or operated by the State or Forest Service within or near the Town of Superior. Consequently, EPA will be a lead agency for necessary Removal Actions conducted on those Site areas.

Iron Mountain Mine and Mill (IMM) Site (OU2):

The IMM site is located 3.5 miles northeast of the Town of Superior. This mine was opened in 1888 and was a primary producer of silver, zinc, and lead. The IMM operated from 1888 until it was closed in 1897 due to safety violations. In 1905, the IMM operator constructed a new tunnel to reach the lower lodge. From 1909 to 1953, the mine produced 7,535,084 pounds of zinc, 5,385,741 pounds of lead, 5,274 pounds of copper, 389,355 fine ounces of silver, and 19 fine ounces of gold. The mine changed ownership multiple times during this period, finally closing 1954. The property is currently owned by the Montana Environmental Custodial Trust. A large waste rock pile (approximately 6,500 cubic yards) and some waste tailings deposits still exist at the mine site. Over the last century, a majority of the

contaminated Site tailings have been washed downstream onto the Flat Creek floodplain. Residual contamination in the floodplain will be remediated by MDEQ and USPS in the future.

Fiat Creek (OU2):

The Flat Creek flows from its' upper drainage area, southwest towards the Town of Superior, a distance of about 9 miles. The IMM mine site is located adjacent to Flat Creek near its confluence with Hall Gulch. Shortly after entering the Superior town limits, Flat Creek enters a culvert leading to the Clark Fork River. The Flat Creek drainage lies mostly within Lolo National Forest. Over the years, IMM tailings were deposited into Flat Creek by repeated sheet flow/flooding events. Most tailings currently in the floodplain are poorly vegetated, and vary in depth between 4 inches and 7 feet. Tailings are observed at various locations from the mouth of Flat Creek (river mile 0.0 - in the Town of Superior) to its confluence with Hall Gulch (river mile 3.7).

Town of Superior (OUI):

The Town of Superior is located in Mineral County, Montana, approximately 3.5 miles down gradient of the IMM, at the confluence of Flat Creek and the Clark Fork River. In the past, the public water supply source for the Town was a spring adjacent to Flat Creek. However, the Town of Superior discontinued use of Flat Creek Spring in 1997 when antimony was detected at concentrations above the EPA's maximum contaminant level (MCL). Currently, the Town of Superior receives drinking water from three production wells located within the town limits and drilled into an underlying confined aquifer (Well 1 - 105.5 feet deep, Well 2 - 118 feet deep, and Well 3 - 214 feet deep).

A. Site Description

The Flat Creek/IMM NPL is a mixed-ownership, hard-rock mining site located on private land, lying partially within and/or surrounded by Lolo National Forest, Superior Ranger District. The Site is generally subdivided into three Operable Units ('OU'): OUI – consisting of residential, commercial, and municipal properties and roadways in and around the Town of Superior; OU2 - the rest of the Site (mine, floodplain, streambed, etc.); and OU3 - a repository (to be constructed) to hold the excavated waste rock and mine tailings associated with Removal/Remedial actions to be conducted within OU1 and OU2 (approximately 75,000 cubic yards of waste).

1. Physical Location

The IMM Site is located at NE NE Sec 13, T17N, R26W, Mineral County, MT (47° 14' 25" N, - 114° 51' 10" W) (US Geological Survey (USGS) 1985a). The IMM is accessible by driving north from Superior on Flat Creek Road to the junction of Flat Creek Road and Hall Gulch road. Superior is approximately 65 miles northwest of Missoula, Montana.

2. Site Characteristics

The Town of Superior consists mostly of residential properties and service industries. There are approximately 410 homes in Superior. The Clark Fork River flows west-northwest through town, dividing it roughly into the south side, location of most residential homes and 'public areas', and the north side, location of a smaller number of residential homes. According to the 2000 US Census, 61 % of town 'workers' were employed by private industry, 27 % by the government, and 11 % were self-employed. The most commonly-cited employers were: educational, health, and social services (25 %); agriculture, forestry, fishing and hunting, and mining (14 %); arts, entertainment, recreation, accommodation, and food services (11 %); and retail trade (9 %). Many jobs are tourism- and recreation-related. Hunting, camping, and other outdoor activities are common in this region. Superior is located at an elevation of

2,710 feet, has an average annual precipitation of 16.58 inches, and an average temperature range of 33.7°F in December to 86.8°F in August.

According to the 2000 census, approximately 17% of the population was age 65 and older while 9% were children 6 years or younger. The population in July 2008 is estimated to be 873. The estimated median household income in 2008 was $33,902.

3. Removal Site Evaluation:

In 1993, the Montana DEQ (formerly the Department of State Lands) conducted an abandoned mine investigation of IMM area. The investigation found elevated levels of lead, arsenic, copper, mercury, zinc, cadmium, manganese, and antimony at the mine site. Levels were three times higher than background samples. Although the waste rock piles still remain on Site, most of the tailings were washed onto the Flat Creek floodplain (MDSL-AMRB 1993).

In August 2000, a lightning storm ignited several wildfires in the Flat Creek drainage, burning more than 9,000 acres. On September 2, 2000, a precipitation event estimated at 0.6 inches in 24 hours resulted in a debris flow that swept into and down Flat Creek. Scouring marks along the banks after the event indicate that tailings were displaced by the runoff As a result of concern that increased runoff into Flat Creek would mobilize additional tailings, Montana DEQ requested that EPA conduct a Preliminary Assessment (PA), and Site Inspection (SI) at IMM, Flat Creek, and Superior.

During 2001, Region 8 EPA conducted a Focused SI (FSI) at the IMM Site, including portions of the Flat Creek drainage and within the Town of Superior where IMM mill tailings had been used as fill material. During the FSI, the Superfund Technical Assessment and Response Team – 3 (START 3), an EPA contractor, collected 44 environmental samples, including source and surface water and Flat Creek drainage sediments. Anaslysis of the samples indicated elevated concentrations of heavy metals including lead, arsenic, antimony, cadmium, and manganese. Also, elevated concentrations of lead and arsenic were found in soil samples collected from the high school track, various residential properties, and a Superior residential neighborhood right-of-way. Because of these results, Region 8 EPA tasked START 3 to collect additional samples from the Town of Superior as part of a removal assessment. Accordingly, in June 2002, soil samples were collected from 64 residential properties, 20 rights-of-way, and 10 town/county and open space properties in and around Superior.

In August 2002, EPA established health-based risk benchmarks of 3,000 parts per million (ppm) for lead and 400 ppm for arsenic, and subsequently conducted a Removal Action 01 on what has become the NPL site OUI ('OU01Rv01'), excavating heavily-contaminated soils in selected areas, to a depth of 12 inches, except for vegetable gardens where excavations were to a depth of up to 24 inches. Accordingly, approximately 6,500 cubic yards of lead- and arsenic-contaminated soil was removed from four driveways, three rights-of-way, the high school track, and a portion of the fairgrounds. The excavated soil was transported to the Mineral County Airport repository.

In 2003, USPS conducted a study of the soil and tailings along National Forest portions of the Flat Creek drainage. Analysis for residual lead and arsenic residues in soil samples collected up gradient of the mine showed residual contaminant levels did not exceed the recreational cleanup level recommended by EPA. Analysis of soil samples collected from two areas down gradient of the Site showed residual contaminant levels exceeding the recommended recreational cleanup levels. The USPS estimated the total volume of tailings in the creek as 2,215 cubic yards.

In 2007, shallow soil samples were collected during excavation for a Superior municipal water line and analyzed for arsenic and lead. Samples were collected (mostly from a depth of 0-6 inches below ground

surface) at West Riverside and 6th Avenue, at Diamond Road and Main Avenue, and along Mullan Road. Levels of arsenic ranged from not detected to 81 ppm and lead ranged from not detected to 804 ppm.

On April 9, 2009, EPA proposed the Flat Creek/IMM Site to the NPL. During the subsequent 60-day public comment period, several comments were received, none of which opposed the listing. Following consideration of the public comments, EPA published a notice in the Federal Register on September 23, 2009, thereby formally adding the Site to its National Priorities List of Superfund Sites.

From August 3 to September 25, 2009, EPA Region 8 – Montana Operations Office (MOO) contracted with CDM in Helena, Montana to conduct the environmental sampling needed to support a Remedial Investigation (RI) of OU01. Soil samples were collected from the originally-targeted 300 properties for field analysis using an X-Ray Fluorescence Spectrometer (XRF). An additional 200 properties are to be sampled in summer 2010. During the 2009 sampling activities in Superior, it was START 3 crews noted that a main source of contamination is the 'reddish' mine tailings material which had been brought into town as fill. In general, analysis of samples collected during the RI showed residual lead concentrations in soils ranged from 260 - 12,576 ppm and arsenic concentrations ranging from not detected - 2,841 ppm. Concurrently, lead and arsenic concentrations on 31 identified properties were greater than the health-based risk benchmarks. EPA will address these OU01 properties as part of this proposed TCRA.

Maximum values found during the 2009 sampling event are found below:

Property Number	Lead (mg/kg)	Arsenic (mg/kg)
Background Sample	6.0	3.9
RY030 (404 Pine St.)	9,629	1,712
RY045 (407 Maple St.)	8,257	1,851
RY053 (618 4th Ave. E)	8,405	2,841
RY084 (1312 5th Ave. E)	3,159	595
RY086 (409 Roosevelt)	7,187	1,806
RY091	2,254	501
RY094 (421 Mullan Road)	5,711	469
RY095 (387 Mullan Road West)	3,166	357
RY101 (40 & 48 Mullan Rd. E)	9,705	2,017
RY112 (1003 5th Ave. East and 410 Arizona Ave.)	4,740	655
RY 115 (Mineral County Fairgrounds)	20,400	2,574
RY125 (303 Spruce St.)	3,840	653
RY140 (207 2nd Ave. W)	3,550	908
RY148 (622 4th Ave. E)	6,842	1,710
RY198 (505 Main Ave.)	4,997	759
RY240 (401 Spruce)	5,540	813
RY251 (604 5th Ave. E)	4,219	174
RY271	1,993	415
RY289 (USFS Property – 209 Riverside Ave. W)	7,043	1,547
RY303 (636 5th Ave. E)	6,200	1,750
RY304 (205 Alder)	4,939	501
RY332 (301 Mullan Rd. W)	5,792	887
RY338 (405 Main St.)	6,708	846

4. **Release or Threatened Release into the Environment of a Hazardous Substance, or Pollutant or Contaminant**

Arsenic and lead (but particularly lead) have been identified at the Site as the contaminants of concern (COCs); however, other metals, including antimony, cadmium, copper, iron, manganese, mercury, silver, and zinc have levels of concentrations at over three times the level of background samples. These metals are hazardous substances, as defined by Section 101 (14) of CERCLA. In the past, waste tailings from the mine were used as surface soil fill on public and residential properties. Contaminated areas were driveways, yards, gardens, public drive-of-way (e.g., along roads) and public facilities. At some time in the past, these hazardous substances appear to have been brought into Town by residents for use as fill for driveways, roadways, sidewalks and other foundations. The properties included in this Removal Action Memorandum contain unusually high levels of lead and arsenic of which lead is highly leachable. The threat posed by this Site is the inadvertent ingestion and inhalation of highly contaminated soil and dust as well as the continued migration of contaminants through wind, surface water and leaching into ground water.

5. NPL Status

On September 23, 2009, EPA formally added the Flat Creek/IMM Superfund Site to its National Priorities List (NPL) of Superfund Sites.

B. Other Actions to Date

1. Previous Actions

From August to November 2002, EPA conducted a TCRA (OU1) [RV1] in the Town of Superior. Contaminated soil was removed from public and private properties, including the high school track, the fairgrounds, and two residential properties. Using the analytical results, EPA established health-based risk bench marks of 3,000 ppm (mg/Kg) for lead and 400 ppm for arsenic for a TCRA. The soil would be removed to a depth of 12 inches, except for vegetable gardens where the removal would be as much as 24 inches. Based on these benchmarks, removal activities were conducted at the following locations:

- The residential driveway at 106 3rd Avenue West
- The south right-of-way at 400 2nd Avenue West
- The east right-of-way at 400 Spruce Street
- The residential driveway at 407 Iron Mountain Heights
- The residential driveway at 401 Spruce Street
- The Mineral County fairgrounds
- The Superior High School track

Approximately 6,500 cubic yards of the contaminated soil and mine tailings failed the TCLP analysis were treated and placed into a repository cell located near the Mineral County Airport. In the Action Memorandum of August 2, 2002, EPA determined that the treated waste, the contaminated soil and mine tailings failed the TCLP analysis, is exempt from regulation under Subtitle C of RCRA resulting from the beneficiation process.

2. Current Actions

Community Involvement: In addition to the sampling and activities that have already been described, EPA has conducted numerous community involvement activities, including public meetings and briefings for public officials. EPA has also conducted community interviews and is finalizing its Community Involvement Plan. The Town of Superior is considering forming a Community Advisory Group (CAG) and a local group is applying for a Technical Assistance Grant (TAG). These groups will include

representatives from diverse interests in Mineral County, which will help the community understand and comment on EPA's action at the Site and more effectively participate in Site-related decisions. In addition, EPA has entered into a Cooperative Agreement with the Town of Superior.

Public Health Screening: Public health screening will be offered as part of on-going public health activities conducted by EPA and its partners. In July, 2010, ATSDR will offer blood-lead and urinary arsenic testing for area residents in coordination with EPA, Montana Department of Environmental Quality, the Montana Department of Public Health and Human Services, and the Mineral County Health Department.

Mine Waste Joint-Repository (OU3): One of the goals of a long-term cleanup plan is to establish a permanent and Site-wide mine waste joint-repository for disposal of approximately 75,000 cubic yards of mine waste rock and tailings associated with the Flat Creek/IMM NPL Site. A proposal to use a portion of Forest Service Lands, which is being transferred to the State of Montana – Department of Natural Resources and Conservation (DNRC), is located in Wood Gulch and administered by the Lolo National Forest, Superior Ranger District for a mine waste repository. This proposed repository is located in OU2, which is within the boundary of the Flat Creek/IMM NPL Site. EPA in coordination with other leading responding agencies, the USES and MDEQ, will discuss a proposal with DNRC to use the Wood Gulch land for mine waste disposal generated from the following sources of contamination:

- Soils in residential areas in and around the Town of Superior
- Former drinking water source
- Abandoned mine and milling properties
- Sediments in and near Flat Creek

A Memorandum of Understanding (MOU) will be generated to provide the framework for the Agencies to coordinate response actions at the Flat Creek/IMM Superfund Site, and to provide a process for resolving disputes among the Agencies that may arise during these response actions including post remedial action activities (e.g. Operation and Maintenance, Institutional Controls).

C. State and Local Authorities' Roles

MDEQ, USES, ATSDR, Mineral County, and the Town of Superior are actively involved at this Site and have agreed with EPA's planned removal activities. MDEQ is actively involved at the Site and has been briefed and supports the planned removal activities. MDEQ has assigned a project manager who is fully engaged in the design and implementation of the investigations and the actions proposed herein.

III. THREATS TO PUBLIC HEALTH OR WELFARE OR THE ENVIRONMENT, AND STATUTORY AND REGULATORY AUTHORITIES

In determining the appropriateness of this removal action, the factors set out in 40 C.F.R. Section 300.415(b)(2) were considered and the partial list of appropriate removal actions as defined in 40 C.F.R. Section 300.415(e) were used as guidance.

A. Threats to Public Health or Welfare

Conditions at the Site meet the criteria for initiating a removal action under 40 C.F.R. Section 300.415 (b) (2) of the National Contingency Plan (NCP). The following factors from Section 300.415 (b) (2) of the NCP form the basis for the EPA's determination of the threat presented and the appropriate action to be taken:

300.415 (b)(2)(i)	Actual or potential exposure to nearby human populations, animals, or the food chain from hazardous substances or pollutants or contaminants;
300.415 (b)(2)(iv)	High levels of hazardous substances or pollutants or contaminants in soils/surface water largely at or near the surface that may migrate; and
300.415 (b)(2)(v)	Weather conditions that may cause hazardous substances or pollutants or contaminants to migrate or be released.

After reviewing the data, EPA has concluded that there is a significant potential for continued lead and arsenic exposure to human populations at the Site. In its Public Health Evaluation of the Public Health Assessment Report for the Flat Creek/IMM (aka Superior Waste Rock) dated January 6, 2010, ATSDR addresses the question of whether exposure to contaminants at the concentrations detected would result in adverse health effects. It noted that, "*As stated previously, a past, current, and future completed exposure pathway to surface soil, sediment, and waste tailings exists for people engaging in hunting, fishing, wading, hiking, and other recreational activities on the Iron Mountain Mine and Mill site and along the Flat Creek floodplain area. In addition, a past, current, and future completed exposure pathway exists to waste tailings used as fill in the Town of Superior.*"

Arsenic is a hazardous substance as defined by Section 101(14) of CERCLA and is a confirmed human carcinogen, producing tumors in the liver and renal system. It is also poisonous by subcutaneous, intramuscular, and intraperitoneal routes. At lower doses ingestion will induce adverse systemic skin and gastrointestinal effects. Inorganic forms of arsenic, such as those found at the Site, are more toxic than organic forms in both acute and chronic exposures. Large doses of arsenic may be acutely fatal. Symptoms include fever, loss of appetite, enlarged liver, and heart rhythm abnormalities. Sensory loss in the peripheral nervous system may also occur. Chronic exposure to arsenic generally results in skin lesions, liver injury, and peripheral vascular disease. The peripheral vascular disease may progress to endarteritis obliterans and gangrene of the lower extremities (blackfoot disease). Arsenic is a human carcinogen based on observation of increased lung cancer mortality due to inhalation exposure and increased skin cancer in individuals exposed to arsenic in drinking water.

Lead is classified as a **B2** carcinogen by EPA. This classification is the result of animal studies determining that these compounds are probable human carcinogens. Lead can enter the body via ingestion and inhalation. Children appear to be the population at greatest risk from toxic effects of lead. Initially, lead travels in the blood to the soft tissues (heart, liver, kidney, brain, etc.), then it gradually redistributes to the bones and teeth where it tends to remain. The most serious effects associated with markedly elevated blood lead levels include neurotoxic effects such as irreversible brain damage. Children have exhibited nerve damage, permanent mental retardation, colic, anemia, brain damage, and death.

B. Threats to the Environment

The primary threat identified is exposure to human populations, particularly children. Pets, and to a lesser degree wildlife, could be affected as they come into direct contact with the contamination within the residential areas.

Wildlife and domesticated animals in adjacent habitats may be exposed to on-site contamination either through direct contact with contaminated soil, flowing and standing water, and sediments, or indirectly through consumption of organisms (algae, aquatic insects, or animals) feeding in the area. Toxic metals-contaminated water with a low pH is present in the surface waters on-site which have a potential to overflow and migrate to wetlands, agricultural land, residences and other recreational areas which are down-gradient from the Site.

The high levels of hazardous substances at or near the surface that may migrate are fully described in Section II, A.3 (Removal Site Evaluation). Arsenic concentration of the soil ranges from 43 to 2,841 mg/kg and lead concentration of the soil ranges from 267 to12,576 mg/kg. The climate of the Iron Mountain Mine and Mill Site in including Flat Creek varies throughout the year. Summer months are usually hot and dry with limited precipitation. The entire area is subject to severe and persistent inversion patterns, and dust storms are common to the area facilitating the migration of contaminated soils throughout the Site.

Only threats posed by human exposure to contaminated soil will be addressed by this Action Memorandum. As part of work to be performed at OU2, threats posed by affected water and sediments will be addressed by USPS and MDEQ in coordination with the EPA Remedial Program.

IV. ENDANGEMENT DETERMINATION

Actual or threatened releases of hazardous substances from this Site, if not addressed by the response action selected in this Action Memorandum, may present an imminent and substantial endangerment to public health, or welfare, or the environment.

V. EXEMPTION FROM STATUTORY LIMITS

A. Exemption from the 12-month and $2 million statutory limits

This Removal Action will require longer than 12 months and more than $2 million to implement. As stated in Section I, an exemption is sought to extend the performance period beyond 12 months and to expend funds exceeding $2 million to implement this Removal Action.

1. Site conditions meet the criteria set forth in CERCLA §104 (c)(1)(A) [40 CFR 300.415(b)(5)(i) of the NCP]. There is an immediate threat to the local population posed by the lead and arsenic released to the environment. The potential threat of direct exposure exists through the inhalation and ingestion of airborne particles and dust. The Site includes properties with elevated lead and arsenic concentrations. These properties are readily accessible to all populations, but the population at highest risk on the Site, and the most exposed because of their activities, are children. High concentrations of lead and arsenic are found in and around the residential/public properties and play area; and, with the onset of the school year, outdoor activities of children will increase, resulting in increased exposure to high concentrations of contaminated soil on a continuing basis.

Children are also the segment of the population at greatest risk from toxic effects of contaminants because their developing organ systems are intrinsically more sensitive to the effects; their behavior characteristics (e.g. mouthing behavior and pica) increase contact with dust and soil; and because children absorb lead from gastrointestinal tract with greater efficiency than adults.

2. Continued response actions are immediately required to prevent, limit, or mitigate an

emergency. If the request for a 12-month statutory exemption is not granted, children, as well as adults living in residential properties on the Site, will continue to be exposed to potentially dangerous levels of lead and arsenic. This Removal is intended to reduce overall exposure to acceptable levels.

3. Assistance from other local government agencies is not anticipated in a timely basis. Mineral County, the Town of Superior, and the State of Montana lack the response capabilities to take any removal actions at the Site. Clearly, the timely completion of this Removal Action can only be accomplished if this statutory exemption request is approved.

B. Consistency Exemption

This Removal Action consistent with the remedial action to be taken at the OU, permanently abates the threat of exposure to high concentrations of hazardous substances, and prevents further migration of contaminants. This Removal Action is consistent with the planned remedial action at OU1 and OU2. As such, the Agency does not expect to conduct further physical actions at this OU. Post-Removal site control (for NPL remedy protection), as necessary, will be globally addressed by the final ROD or EE/CA. The Removal Action discussed herein permanently reduces the risk of human exposure to concentrations of hazardous substances that present an unacceptable risk. Also, the added soil cover further mitigates the potential for migration of contaminants.

Removal of soils with high levels of lead and arsenic will prevent leaching of contaminants to groundwater. It will also eliminate runoff to surface water and windblown dispersal that may be impacting other environmental receptors and undeveloped lands. Nothing in this action will prevent or hinder the ability to conduct other necessary response activities at OU I and OU2.

VI. PROPOSED ACTIONS

A. Proposed Action Description

1. Proposed Action Description

The clean-up action levels and the selected removal activities specified below are consistent with the August 2, 2002 Time-Critical Removal Action Memorandum and future remedial actions. The selected removal for OU I is excavation of contaminated soils, on-site treatment of TCLP-failed soil including mine tailings, and on-site disposal at the proposed permanent joint-repository (OU3) located within the Site boundary (OU2).

The NCP and Section 121 of CERCLA specify that the selected remedy must be protective of human health and the environment, comply with ARARs to the extent practicable, be cost effective, utilize permanent solutions and alternative treatment technologies to the maximum extent possible, and show a preference for treatment. Therefore, on-site stabilization (TCLP > 5 mg/L) and on-site disposal of approximately 20,000 tons of contaminated soils have been chosen as the selected remedy for this Removal Action. This selected remedy provides a reduction of the mobility and toxicity of contaminants in the excavated soil and is cost-effective.

In coordination with the other response agencies (USES and MDEQ), EPA is in discussions with the DNRC regarding the proposed permanent joint-repository. This repository is expected to be constructed within OU2 and receive materials beginning in 2011. In the mean time, for this Removal Action, a small (approximately 2-acre) temporary treatment/staging area and access roads will be constructed in June 2010.

The major components of the selected removal include:

- Mine tailings and the contaminated soil at the residential and other affected properties in the Town of Superior including rights-of-way will be excavated and staged in bulk for treatment and disposal. The staging/treatment facility will be constructed for both this Removal Action and potential future Remedial or Removal Actions if the permanent joint-repository is not completed in time to be of use by this removal. EPA will evaluate alternative treatment and disposal options based on the TCLP analytical results and the volume of the hazardous waste before an appropriate treatment/disposal option is selected. As previously stated, the mine tailings are waste resulting from the beneficiation process; therefore, this waste is exempt from regulation under Subtitle C of the Resource Conservation and Recovery Act (RCRA).

- Excavation of surface soil with an average concentration that exceeds 3,000 ppm of lead and 400 ppm of arsenic. The soil will be generally removed to a maximum depth of 12 or more inches, except for vegetable gardens and play areas, which will be removed generally to a maximum depth of 24 inches. Contaminated soils located beneath residential structures, sheds, garages, sidewalks, concrete driveways, capped parking lots, etc. will remain in place.

- Replacement with clean backfill, then four to six inches of topsoil, and landscaping of affected properties. EPA and its contractor will work with property owners to ensure that properties are returned to as close to original condition as possible.

- Property owners will receive an assurance that construction and vegetation are warranties for one year after the construction and landscaping are completed. Existing trees, shrubs, and bushes will be removed and replaced with the same or other locally available species and standard nursery stock. Detailed plan(s) with removal schedule will be developed for each affected property. These will be provided to the property owner.

2. Contribution to Remedial Performance

The Removal Action will mitigate both current and potential health risks to children within residential portions of OU1. The cleanup actions are consistent with past and planned future remedial actions for OU1.

3. Description of Alternative Technologies

As previously discussed in the August 2, 2002 TCRA, a large volume of contaminated soils and mine tailings failed the TCLP analysis, are therefore considered RCRA hazardous wastes. However, the contaminated soils and mine tailings are waste resulting from beneficiation process; as a result, they are exempt from regulation under Subtitle C of RCRA. EPA has adopted a flexible approach for this Removal Action, based on site-specific circumstances and other appropriate disposal of waste. Alternative approaches, such as on-site and/or in-situ treatment prior to final disposal will be considered where appropriate. The decision will be made will be based on whether alternative technologies and techniques are practical, provide less handling-time and/or result in disposal costs effective to achieve the overall Removal Action objectives.

4. Engineering Evaluation/Cost Analysis (EE/CA)

This is a Time-Critical Removal Action; thus, and EE/CA is not required for alternative actions.

5. Applicable or Relevant and Appropriate Requirements (ARARs)

Since this Action is being conducted as a Time Critical Removal Action, all Federal and State ARARs may not have been identified at this time. This Removal Action will attain, to the extent practicable, and considering the exigencies of the situation, all applicable or relevant and appropriate (ARAR) Federal, State or local standards, criteria or regulations. The ARARs identified to date are provided as Attachment 2.

6. Project Schedule

Removal activities are tentatively scheduled to begin in June 2010. Completion of restoration and monitoring of landscape restoration will continue into Spring 2011.

B. ESTIMATED COSTS

EXTRAMURAL COSTS	TASK	Estimated Costs
Regional Removal Allowance Costs:	Total Cleanup Contractor Costs - Emergency and Rapid Response Services (ERRS): • Excavation and Restoration • Preparation of Treatment/Staging Facility • Transportation and Disposal	 $800,000 $100,000 $300,000
	Subtotal	$1,200,000
Other Extramural Costs Not Funded from the Regional Allowance:	Total START, including multiplier costs • Sampling, analytical, design, surveying • Treatabiiity Study • Geotechnical Study (Repository)	 $250.000 $50.000 $100,000
	Subtotal	$400,000
20% Extramural Costs Contingency		$320,000
	Total Extramural Costs	$1,920,000

TOTAL REMOVAL ACTION PROJECT CEILING **$ 1,920,000**

VII. EXPECTED CHANGE IN THE SITUATION SHOULD ACTION BE DELAYED OR NOT TAKEN

The preliminary assessments indicate, based on the concentrations of lead and arsenic measured in the soil, that the contaminated soil at this site may pose an acute health risk to the residents. If no removal action is taken at the Site or if the action is delayed, the residents in the area will continue to be exposed to high levels of lead and arsenic.

VIII. OUTSTANDING POLICY ISSUES

In 2002, EPA conducted a TCRA (OU1)[RV1] in the Town of Superior. At that time the Mineral County Board of Commissioners agreed to let EPA store approximately 6,500 cubic yards of contaminated soil including mine tailings on County property near the Mineral County Airport, in a permanent repository. More recently, the Commissioners have asked EPA to move these contaminated soils from the County property to the permanent mine waste repository (OU3) when it becomes available.

IX. ENFORCEMENT

A separate memorandum has been prepared to provide a confidential summary of current and potential future enforcement actions (Attachment 3).

The total EPA costs for this removal action, based on full-cost accounting practices that will be eligible for cost recovery are estimated at:

REMOVAL PROJECT CEILING	$1,920,000
EPA's Direct Intramural Costs	$ 200,000
Subtotal	$2,120,000
Regional Indirect Costs, 35% (*)	$ 742,000
Estimated EPA Costs for the Removal Action	$2,862,000

(*) Direct Costs include direct extramural costs and direct intramural costs. Indirect costs are calculated based on an estimated indirect cost rate expressed as a %age of site-specific direct costs, consistent with the full cost accounting methodology effective October 2, 2000. These estimates do not include pre-judgment interest, do not take into account other enforcement costs, including Department of Justice costs, and may be adjusted during the course of the removal action. The estimates are for illustrative purposes only and their use is not intended to create any rights for responsible parties. Neither the lack of total costs estimates nor deviation of actual costs from this estimate will affect the United States' right to cost recovery.

X. RECOMMENDATION

This decision document describes the selected Time-Critical Removal Action for the Residential Operable Unit (OU1) of the Flat Creek/IMM NPL Site located near and in the Town of Superior, Mineral County, Montana, developed in accordance with CERCLA, as amended, and not inconsistent with the NCP. This decision is based on the administrative record for the Site.

Conditions at the Site meet the NCP §300.415 (b) (2) criteria for a removal, and I recommend your approval of the proposed Time Critical Removal Action. The total removal ceiling, if approved, is expected to be $2,862,000.

Approve: Carol L Campbell Date: 6/10/10

Carol L. Campbell
Assistant Regional Administrator
Office of Ecosystems Protection and Remediation

Disapprove: _____ Date: _____

Carol L. Campbell
Assistant Regional Administrator
Office of Ecosystems Protection and Remediation

Attachments:

Attachment 1:	Time-Critical Removal Action Memorandum (August 2, 2002)
Attachment 2:	ARARs
Attachment 3:	Enforcement Addendum
Figure 1:	The Flat Creek/IMM NPL Site Location Map
Figure 2:	Properties of Concern
Exhibit 1:	Sample Results of Affected Properties

SUPPLEMENTAL DOCUMENTS

Support/reference documents that may be helpful to the reader and/or have been cited in the report may be found in the Administrative Record File at the Superfund Records Center for Region VIII EPA – Montana Office, 10 West 15th Street, Suite 3200 in Helena, Montana. EPA has also provided a local source of information on the second floor of the Mineral County Courthouse at 300 River Street in Superior, Montana.

Attachment 3

ATSDR Agency for Toxic Substances & Disease Registry

Final Report Published for Flat Creek IMM site

Mineral County, Superior, Montana
Friday, January 22, 2010

Frequent contact with waste tailings on the Iron Mountain Mine and Mill (IMM) site, the Flat Creek floodplain, and the town of Superior could harm people's health, reports a federal health assessment. Levels of arsenic and lead are of public health concern if residents, particularly children, repeatedly contact areas affected by waste tailings in and around Superior, MT.

The Agency for Toxic Substances and Disease Registry (ATSDR) looked into possible health effects from heavy metals in waste tailings -- materials left over from the mining process after ore has been removed -- from the IMM site in soil, creek water and drinking water. The agency finalized its report this month after accepting public comments.

The IMM site formerly was home to mining and milling operations, and leftover waste tailings have contaminated portions of the IMM site and the Flat Creek floodplain. Waste tailings were also used in the town of Superior as fill material for roads, driveways, and yards. In 2002, the U.S. Environmental Protection Agency tested the soil in town and removed some mine tailings used as fill material because of possible short term health risks. This ATSDR assessment looked at the possibility of both short and long term health risks from past, current, and future contact with the waste tailings contamination.

Results included:

- Soil: Arsenic and lead levels are of public health concern for children and adults who repeatedly contact areas affected by waste tailings on the IMM site and Flat Creek floodplain. Because the contaminated areas at the IMM site and floodplain area are posted with warning signs, ATSDR expects recreational activities in these areas to be infrequent.

In town, heavy metals detected in soil at most residential and non residential areas are not at levels of health concern. However, four residences tested have lead levels and two of these four residences have arsenic levels that could be problematic for children who play regularly in the soil. The potential also exists that additional properties in town that were not tested might contain waste tailings.

- Flat Creek: Harmful health effects are not expected for children and adults who have skin contact or drink small amounts of Flat Creek surface water while wading and fishing. Using creek water for drinking, showering, bathing, cooking, and washing dishes is not expected to cause harmful health effects. Nonetheless, scientists found that levels of antimony and lead in the creek exceed regulatory guidelines, and the creek has occasionally been used as a drinking water source. ATSDR recommends efforts to reduce drinking water exposures when chemical levels are above regulatory guidelines. Children who drink one liter or more of Flat Creek water per day could have blood lead levels of concern.
- Hall Gulch: Surface water in the Hall Gulch area would be at levels of public health concern if the water were drunk frequently. However, ATSDR would not expect people to drink or wade in this shallow, reddish-brown surface water.

- Drinking water: Chemicals found in water from city wells, Flat Creek Spring, and one private well tested were not at levels of public health concern. However, in the past, antimony levels in Flat Creek Spring and the private well exceeded regulatory guidelines. ATSDR did not have enough data to evaluate water from private wells on the north side of town.

ATSDR recommends further efforts to minimize exposure to the contamination, such as removing waste tailings deposits on the IMM site and floodplain, and continuing to post warning signs about arsenic and lead at the mine site and floodplain area. The agency also recommends continued work with the community to determine which areas of town should be studied further.

A copy of the public health assessment is located at:

Mineral County Courthouse
300 River Street
Superior, MT 59872
Contact: Tim Read
Phone: 406-822-3526

Or

Mineral County Public Library-Superior
301 2nd Avenue East
Superior, Montana 59872
Contact: Guna Chaberek
Phone: 406-822-3563

The report can also be found online at http://www.atsdr.cdc.gov/HAC/PHA/HCPHA.asp?State=MT

For more information, community members may contact Dan Strausbaugh at (406) 457-5007.

Members of the news media can request an interview by calling the NCEH/ATSDR Health Communication Science Office at 770-488-0700.

Related PHA & HC For this Press Release

Flat Creek IMM (aka Superior Waste Rock)
Document Date: 1/6/2010 - PHA [PDF - 2340 KB]

Related News Releases For Mineral County, Superior, Montana

Public Comments Sought on Public Health Assessment for Flat Creek IMM site, Comments Accepted through August 14, 2009
Release Date: Wednesday, July 01, 2009
Frequent contact with waste tailings on the Iron Mountain Mine and Mill (IMM) site, the Flat Creek floodplain, and the town of Superior could harm people's health, says a federal health

assessment. Levels of arsenic and lead are of public health concern if residents, particularly children, repeatedly contact areas affected by waste tailings in and around Superior, MT.

Page last reviewed: March 3, 2011
Page last updated: March 3, 2011
Content source: Agency for Toxic Substances and Disease Registry

Agency for Toxic Substances and Disease Registry, 4770 Buford Hwy NE,
Atlanta, GA 30341
Contact CDC: 800-232-4636 / TTY: 888-232-6348

TARGET SHEET

EPA REGION VIII

SUPERFUND DOCUMENT MANAGEMENT SYSTEM

DOCUMENT NUMBER: 1207667

SITE NAME: FLAT CREEK IMM

DOCUMENT DATE: 09/27/2011

DOCUMENT NOT SCANNED

Due to one of the following reasons:

- ☐ PHOTOGRAPHS
- ☐ 3-DIMENSIONAL
- ☑ OVERSIZED
- ☐ AUDIO/VISUAL
- ☐ PERMANENTLY BOUND DOCUMENTS
- ☐ POOR LEGIBILITY
- ☐ OTHER
- ☐ NOT AVAILABLE
- ☐ TYPES OF DOCUMENTS NOT TO BE SCANNED
  (Data Packages, Data Validation, Sampling Data, CBI, Chain of Custody)

DOCUMENT DESCRIPTION:

FIGURE 1 SITE DETAIL MAP

Contact the Superfund Records Center to view available document.
(303) 312-6473

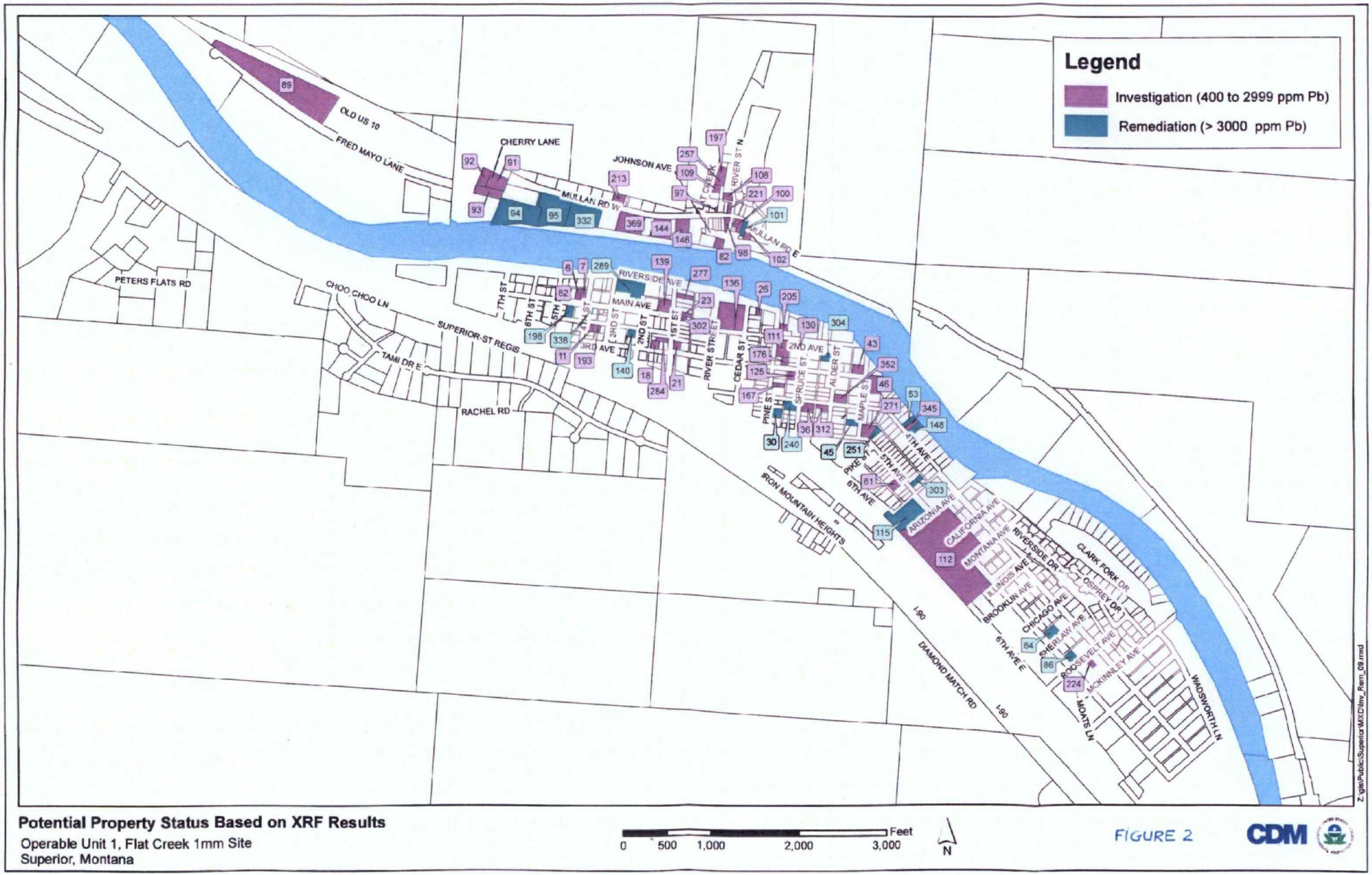

Legend
Investigation (400 to 2999 ppm Pb)
Remediation (> 3000 ppm Pb)
OLD US 10
FRED MAYO LANE
CHERRY LANE
JOHNSON AVE
MULLAN RD W
MULLAN RD E
PETERS FLATS RD
CHOO CHOO LN
SUPERIOR ST REGIS
TAMI DR E
RACHEL RD
RIVERSIDE AVE
MAIN AVE
2ND AVE
3RD AVE
4TH AVE
5TH AVE
6TH AVE
6TH AVE E
7TH ST
6TH ST
5TH ST
4TH ST
3RD ST
2ND ST
1ST ST
RIVER STREET
CEDAR ST
SPRUCE ST
ALDER ST
MAPLE ST
PINE ST
RIVER ST N
CAT CREEK
IRON MOUNTAIN HEIGHTS
DIAMOND MATCH RD
I-90
ARIZONIA AVE
CALIFORNIA AVE
MONTANA AVE
RIVERSIDE DR
ILLINOIS AVE
BROOKLIN AVE
CHICAGO AVE
SHERLAW AVE
ROOSEVELT AVE
MCKINNLEY AVE
MOATS LN
OSPREY DR
CLARK FORK DR
WADSWORTH LN
Potential Property Status Based on XRF Results
Operable Unit 1, Flat Creek 1mm Site
Superior, Montana
0 500 1,000 2,000 3,000 Feet
N
FIGURE 2
CDM
Z:\gis\Public\Superior\MXD\Inv_Rem_09.mxd

Figure 3

RECLAMATION

Managing Water in the West

Wood Gulch Repository Design
Flat Creek IMM- NPL Site,
Mineral County, Montana

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Prepared For: Environmental Protection Agency
Region 8, Denver, Colorado

U.S. Department of the Interior
Bureau of Reclamation
Technical Service Center
Denver, Colorado June, 2011

Mission Statement

The mission of the Department of the Interior,is to protect and provide access to our Nation's natural and cultural heritage and honor our trust responsibilities to Indian Tribes and our commitments to island communities.

The mission of the Bureau of Reclamation is to manage, develop, and protect water and related resources in an environmentally and economically sound manner in the interest of the American public.

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Wood Gulch Repository Design
Flat Creek NPL Site, Mineral County, Montana

Executive Summary

The Environmental Protection Agency has been performing a Removal Action at the Flat Creek NPL Site, located at the town of Superior, in Mineral County, Montana. The Flat Creek NPL Site consists of three source areas: the Iron Mountain Mine and Mill, portions of Flat Creek downstream of the Iron Mountain Mine, and portions of the town of Superior where mill tailings have been used as fill.

This report describes the site conditions and design for a mine waste repository to be established near the Site at the mouth of Wood Gulch which is a tributary of Flat Creek. It is planned that the Wood Gulch Repository will contain the waste materials to be removed from all three source areas. A volume of 100,000 cubic yards of contained waste is the target volume for the Wood Gulch Repository design. The 100,000 yd^3 of waste is anticipated to be comprised of 30,000 yd^3 from EPA removal activities, 30,000 yd^3 from Montana DEQ and US Forest Service sources, 10,000 yd^3 from Mineral County, and a 30,000 yd^3 safety factor in case some sources generate more than anticipated.

The majority of the mining wastes consist of mill tailings, and mill tailings mixed with topsoil, which have been removed from private properties in the tovm of Superior. These wastes have been temporarily stockpiled near the end of the runway at the Mineral County Airport. In addition to the wastes from the town of Superior, wastes from the stream corridor of Flat Creek (mill tailings mixed with stream sediment), and wastes from the Iron Mountain Mine (tailings and waste rock) will also be moved to the Wood Gulch Repository.

Two of the contaminants of concem associated with the Flat Creek NPL Site, arsenic and lead, are at such concentrations that there are human health concerns (ATSDR, 2010). In addition, water in Flat Creek caries elevated levels of antimony which has forced the town of Superior to discontinue using their existing water intake in Flat Creek and establish an alternate drinking water source. The mineral boulangerite ($Pb_5Sb_4S_{11}$) was a prominent mineral component in the ores of the Iron Mountain Mine and it is present as silver-colored masses and needle-shaped crystals in some of the waste rock remaining at the mine. The mine waste rock also contains significant amounts of pyrite (Fe_2S) and sphalerite (ZnS) and small amounts of galena (PbS) and chalcopyrite ($CuFeS_2$). The weathering of waste rock is causing acid generation and iron salts can be observed coating much of the waste material at the site. There also is a contaminated spring in Hall Gulch at the Iron Mountain Mine which is believed to actually be a partly collapsed adit entrance which drains portions of the underground mine workings. Contaminated flow from the adit runs across waste rock materials deposited in Hall Gulch before reaching Flat Creek.

In the Fall of 2010 the Bureau of Reclamation conducted site investigations at the Wood Gulch Repository Site. The area was surveyed and a topographic map of the site has been prepared. Six test pits were excavated and the soils materials were logged and photographed. The results of the test pit investigation are documented in this report. Samples of the near-surface soils were submitted to EPA contractor "ER" for analysis to verify that the Wood Gulch Soils are not contaminated with heavy metals. It is proposed to use the on-site soils (topsoil and subsoil) as capping material for the mine wastes that will be deposited at the site. The geotechnical investigations found that the site is suitable for use as a repository of mine waste.

In addition to the engineering investigations, the EPA has engaged an archeologist to perform a cultural resources survey of the site and a biologist will evaluate the biological resources of the site including a survey for threatened and endangered species. The east side of the Wood Gulch site may be the historic Superior Ranger district location and the archeologist has been informed to consider this possibility when performing the cultural resources survey. The environmental investigations will be documented separately.

This report documents the design approach and proposed implementation sequence for establishment of a mine waste repository at Wood Gulch. Additional planning and coordination for the mine waste removal from the Iron Mountain mine and removal of the sediments from Flat Creek is required, but is beyond the scope of this report. It is anticipated that the removal of mine waste from the various sources will occur over a period of several years. The repository has been divided into cells in order to allow for efficient sequential addition of the mine waste. Although three cells are shown, it is in a sense conceptual. The cell design is flexible in that the repository will be filled from north progressing to the south such that partial cells or multiple cells can easily be accommodated. Due to the nature of the site, temporary stockpiles of topsoil and excavated clean subsoil will need to be stored onto the cells not being worked. Initially all of the vegetation would be cleared so the cells not under active filling can be used for stockpile and staging activities. It is the intent that the site clearing, fencing, installation of access roads and ditches would initially be installed at the onset. The future work (after EPA has filled Cell 1) would be limited to cell excavation, placing clean soil material in stockpiles, filling cells with mine waste, capping, and minor ditch adjustment. Weed control and vegetation monitoring would also be performed.

Introduction

This report documents site investigations and the design for the Wood Gulch Mine Waste Repository to be established in Mineral County, Montana. The Wood Gulch Repository is being developed in a cooperative effort between the EPA, State of Montana, USDA Forest Service, and Mineral County, Montana for permanent disposal of mining related waste associated with the Flat Creek National Priorities List (NPL) Site. The EPA has taken the lead on the design and construction of the Wood Gulch Repository.

The Flat Creek NPL Site consists of three source areas: the Iron Mountain Mine and Mill, portions of Flat Creek downstream of the Iron Mountain Mine, and portions of the town of Superior where mill tailings have been used as fill. The Iron Mountain Mine and Mill was the original source of the heavy-metals contaminated wastes. Some of this waste material was later transported to the town of Superior for use as fill, and some waste from the mine and mill have migrated down gradient into the stream corridor of Flat Creek. It is believed that the mill also processed some ores from a few other smaller mines in the area.

Cleanup activities have been ongoing since 1998 when the American Smelting and Refining Company (ASARCO) performed reclamation activities at the mine by removing some tailings from Flat Creek and placing them in an impoundment on the mine property. Additional tailings along Flat Creek were revegetated in place. Preliminary Assessment of the Flat Creek NPL Site was first performed in 2001. Removal of some of the mine wastes followed the initial study and another Preliminary Assessment was completed in 2007 (URS Operating Services Inc., 2007). Contaminants of concem include arsenic, antimony, lead, and manganese. In 2009 the Agency for Toxic Substances and Disease Registry completed a Public Health Assessment for the site concluding that levels of arsenic and lead at a few properties were elevated enough to be health concerns for ingestion and inhalation of the wastes (ATSDR, 2010). Additional cleanup activities are ongoing as a result of the evaluations. It is planned that mine wastes from the three source areas will be deposited at the Wood Gulch Repository. Reclamation has prepared a topographic map (see Figure 1) and conceptual design for the repository. Final design is currently proceeding and is expected to be complete by December of 2010.

Location and Land Status

The proposed Repository is located two miles north of the town of Superior, in eastern Mineral County, Montana. The Repository Site is located within the southeast ¼ of the southwest ¼ of Section 14 and extends a short distance into the southwest ¼ of the southeast ¼ of Section 14 of Township 17 N Range 26 W of the Montana Principal Meridian (see Figure 2). The Wood Gulch Repository Site consists of National Forest Lands which are the subject of a pending land exchange with the State of Montana, Department of Natural Resources. Upon completion of the land exchange, the property will be transferred to the State of Montana and become a part of the Montana State Trust Lands.

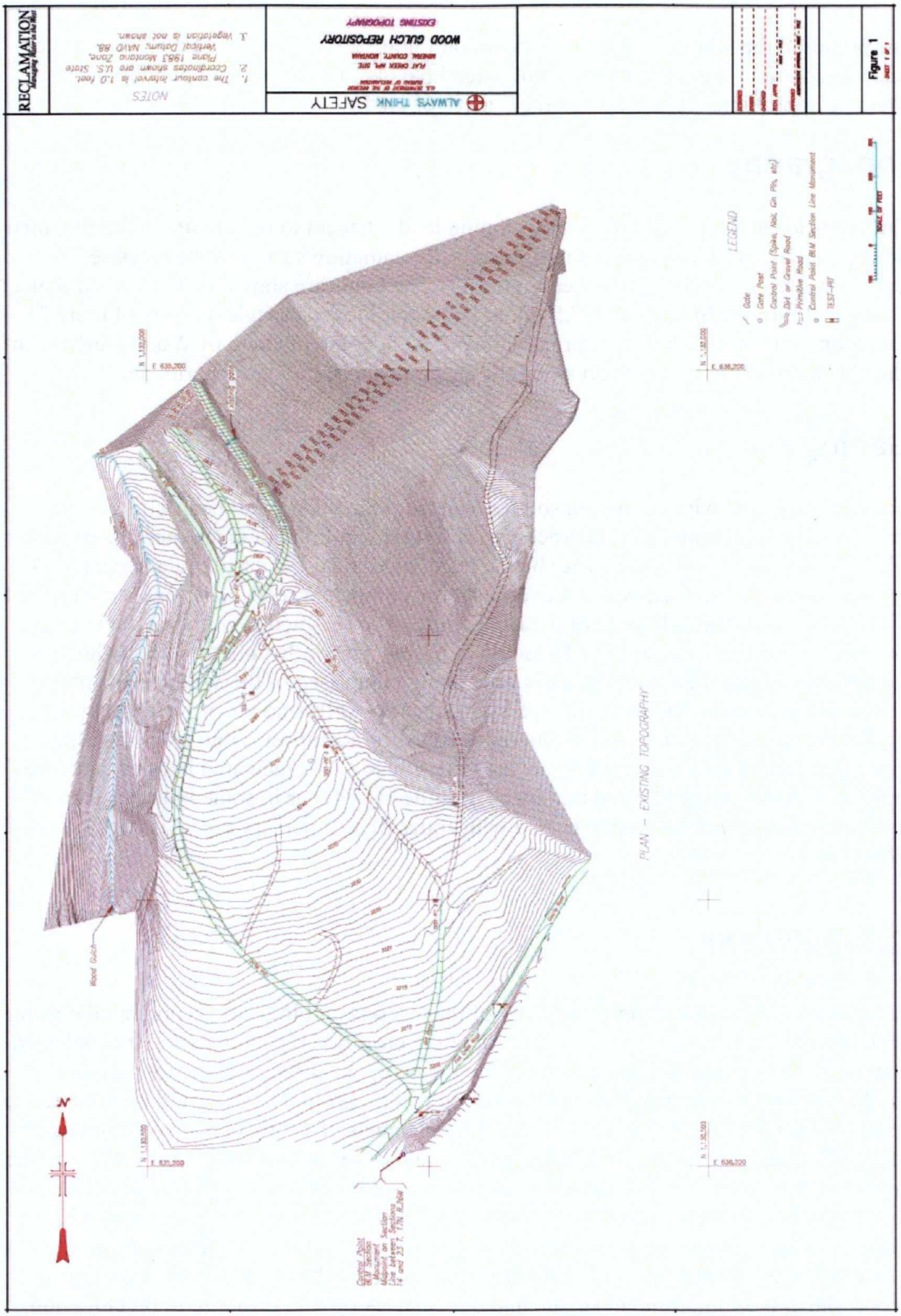

Figure 1. Plan map showing existing topography at the proposed Wood Gulch Repository. A portion of Wood Gulch is shown on the left side of the map.

The proposed repository boundary is shown on Figure 29 and incorporates 8.76 acres of land. In addition, drainage features will extend beyond the repository boundaries affecting approximately an additional 0.2 acres of land.

Topography

The site is located on gently to steeply sloping land adjacent to the mouth of Wood Gulch which empties into Flat Creek. The Bureau of Reclamation surveyed the proposed repository area in August, 2010 (see Figure 1). The lands are shown on the United States Geological Survey, Idaho Gulch 7.5-minute topographic quadrangle map (see Figure 2). Elevations vary from a low of approximately 3200 near the junction of Wood Gulch with Flat Creek to a high of 3305 feet along the east repository boundary perimeter fence.

Geology

The site is covered with colluvium soil derived from the underlying bedrock. Test pits show that the soil mantle over bedrock varies from 8 feet thick to much more than 18 feet thick. Some of this soil mantle may be the result of Glacial Lake Missoula deposits. At depth a layer of weathered bedrock overlies more competent rock. The rock is comprised of Precambrian meta-sediments of the Belt series. The sediments overlying the bedrock may be the result of Glacial Lake Missoula deposits. One mile north of Wood Gulch at the Iron Mountain Mine the bedrock is principally comprised of the Wallace Formation. The Wallace formation is characterized by pinch and swell couplets of white quartzite usually calcareous and fine to very fine-grained that grade upward into black argillite caps. Beds of limestone and dolostone are widespread. Amalgamated beds of quartzite grading to calcareous siltite and thin black argillite caps occur in some intervals, and commonly underlie ore are interspersed with zones of sedimentary breccias (USGS, 1986).

Groundwater

Groundwater was not encountered in any of the test pits and indications are that the water table is more than 20 feet below the surface at the proposed repository site. It is believed that the groundwater flows are controlled by the bedrock surface and the topographic conditions. At the location of the proposed repository, groundwater would be expected to be below the elevation of the existing drainage channels of Wood Gulch and Flat Creek. These drainage features are 25 to 30 feet lower in elevation than the ground surface at the proposed repository. Test pits at the proposed repository as deep as 18 feet showed dry soils at the bottom of the excavation which supports the conclusion that the bedrock surfaces in the drainage bottoms control the groundwater table. EPA is installing monitor wells and will collect water level data over time to verify the groundwater conditions. Wood Gulch is an intermittent stream and only carries flow in response to precipitation and snowmelt.

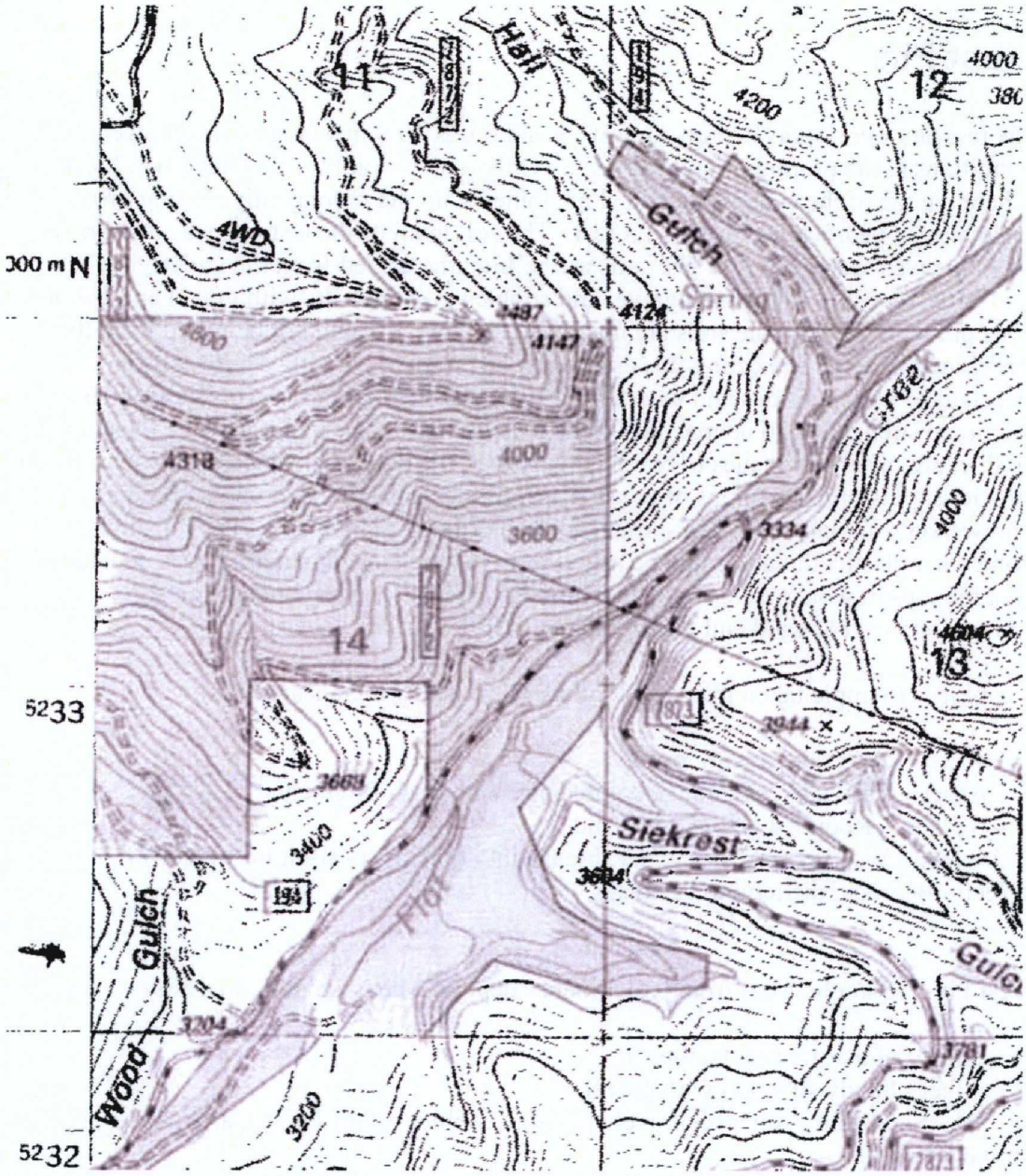

Figure 2. Image showing a portion of the U. S. Geological Survey topographic map showing the relative locations of Wood Gulch, Flat Creek, and Hall Gulch. Forest Service lands are not shaded. Shaded areas represent private and State owned lands. The Iron Mountain Mine is located within the shaded area on Hall Gulch. Contaminated sediments extend from the confluence of Hall Gulch with Flat Creek to the southwest along Flat Creek. The proposed repository is located just to the right of the word "Gulch" of the Wood Gulch label shown on the map.

Test Pits

Six test pits were excavated on August 19 and 20, 2010 to investigate the geotechnical conditions at the proposed repository site. Only one test pit (no. 1), which was located where the toe of the steep mountain slope joined with the more gently sloping ground, encountered bedrock at a depth of 8 feet. The soil in all of the test pits was dry, and no moisture was seen at depth. The soils are colluvium derived from the underlying bedrock and vary from silty sands with gravel and cobbles to sandy silts with gravel and cobbles. Except for the topsoil, the soils are not plastic. A thread could not be rolled from the moistened material indicating it is essentially a cohesionless soil. These soils are pervious to very pervious and have a high frictional strength. For geotechnical design a frictional strength of 36 degrees would be reasonable for this material. The topsoil varied in thickness from six inches to two feet; however, the deeper topsoil was encountered in previously disturbed portions of the site. All of the excavations in undisturbed areas showed only six inches of dark-brown colored organic-rich topsoil. The topsoil is somewhat plastic, threads could be rolled from the moistened material. It is concluded that the topsoil would have a much lower permeability than the underlying soil. All of the test pits were logged and photographed as follows:

Test Pit 1 (Sample taken from 3-4 foot depth for heavy metals analysis)

0-2 feet - Grass mixed with topsoil.
2 – 6 feet – Brown to mst orange colored soil with trash fragments.
6 – 6.5 feet – Rounded gravel with sand.
6.5-8 feet – Weathered bedrock, dry, breaks into thin layers (Belt Formation)
8 feet – Bedrock, difficult to excavate.

Test Pit 2 (Sample taken from 0 to 3 inches depth for heavy metals analysis)

0 – 2 feet - Grass, tree roots, topsoil
2 – 4 feet - Sandy silty soil with gravel
4 – 10 – Sandy silty soil with gravel and large cobbles (6" to 1.5 ft.), approximately 50% gravel in places
10 – 13 Sandy silt and silty sand with minor gravel, bone dry and dusty.

Test Pit 3 (Sample taken from 0 to 4 inches depth for heavy metals analysis)

0 – 1 feet Grass, roots, topsoil.
1 – 15 feet – Sandy silty soil with gravel, few cobbles maximum size 6 inches, dry.

Test Pit 4 (Sample taken from 0 to 6 inches depth for heavy metals analysis)

0 – 0.5 feet – Grass, roots, topsoil.
0.5 – 16 feet – Sandy silty soil with gravel and cobbles up to 6 inch diameter.

Test Pit 5 (Sample taken from 0 to 6 inches depth for heavy metals analysis)

0 – 0.5 feet – Grass, roots, topsoil.
0.5 – 4.0 feet sandy silty soil, little gravel.
4.- 8 feet – Orange-brown colored sandy silty soil with approximately 20% gravel.
8 – 18 feet – Sandy silty soil with 30% gravel and cobbles to 8 inches in diameter.

Test Pit 6 (Sample taken from 0 to 6 inches depth for heavy metals analysis)

0 – 1 feet - Grass, roots, topsoil.
1 – 14 feet – Sandy silty soil with gravel and cobbles to 6 inches diameter. Gravel is about 30% of the material and cobbles are about 10% of the material excavated.

Figure 3. Photograph showing the excavation of Test Pit 1. The pit encountered a trash deposit with rust-colored soil, numerous rusted fragments of food cans and glass bottles. The glass bottles were preserved to assist in evaluation of this potential cultural resource by an archeologist.

Figure 4. Photograph showing excavation of test pit 1. Note that the soil is dry and its movement creates a dust plume.

Figure 5. Photograph showing a close up view of a rusted can and rust-colored soil from test pit 1.

Figure 6. Photograph showing gravel, cobbles, and fragments of a can and a glass shard from test pit 1.

Figure 7. Photograph showing silty soil with gravel and cobbles from test pit 1.

Figure 8. Photograph showing excavation of Test Pit 2 located near the southeast corner of the proposed Wood Gulch Repository.

Figure 9. A large cobble lies on coarse gravel from test pit 2.

Figure 10. Spoil pile from excavation of test pit 2. Note the dry condition of the material.

Figure 11. View of thick zone of topsoil containing tree roots at test pit 2.

Figure 12. View of coarse gravel and cobbles in silty sandy soil from test pit 2.

Figure 13. Completed excavation of test pit 2.

Figure 14. Photograph showing excavation of Test Pit 3.

Figure 15. Photograph showing completed excavation of test pit 3.

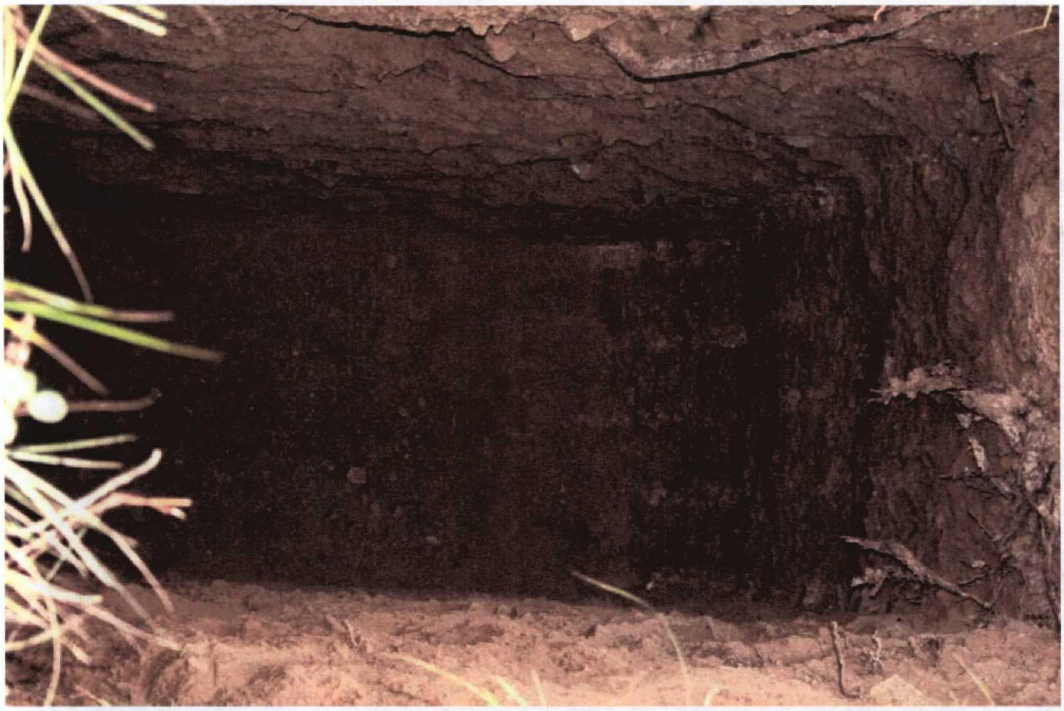

Figure 16. Photograph showing the bottom of the excavation of test pit 3.

Figure 17. Photograph showing the spoil pile from the excavation of test pit 3.

Figure 18. Photograph showing the start of the excavation of test pit 4.

Figure 19. Photograph showing soil removed from test pit 4. Note the dust plume due to the dry condition of the soil.

Figure 20. Photograph showing the upper portion of test pit 4. Note the organic topsoil layer is approximately 6-inches thick and has a distinctive dark-brown color.

Figure 21. Photograph showing the completed excavation of test pit 4.

Figure 22. Photograph showing spoil pile next to completed excavation of test pit 4.

Figure 23. Photograph showing excavation of test pit 5. Note the dust plume due to the dry condition of the soil.

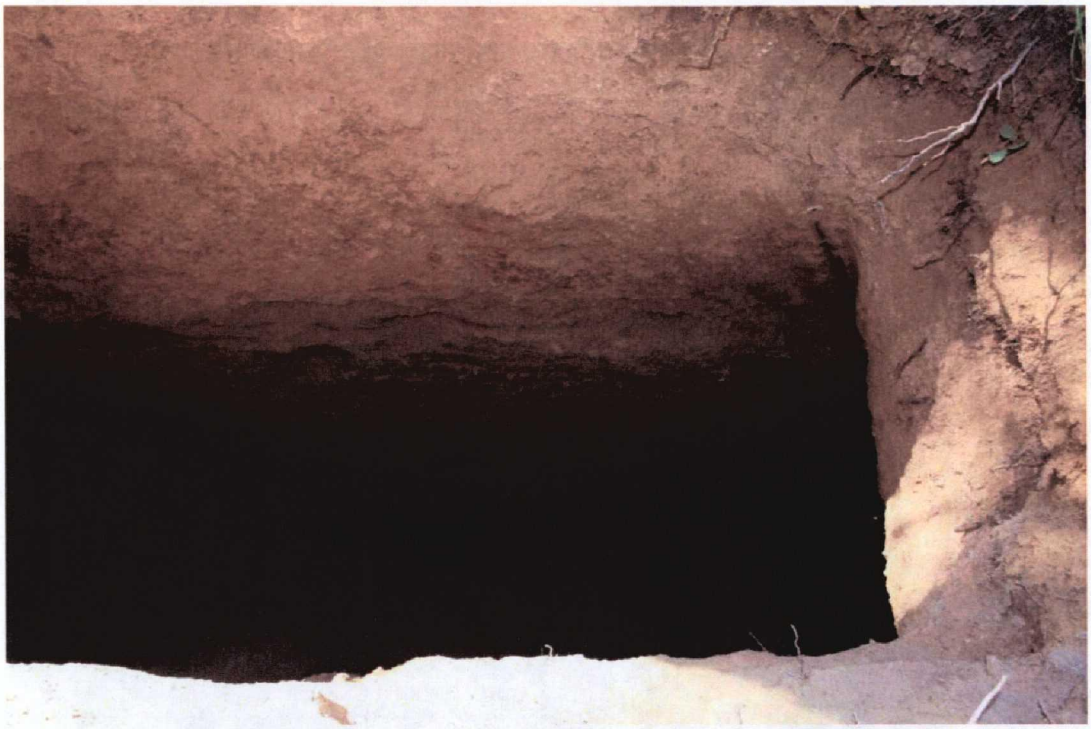

Figure 24. Photograph showing the completed excavation of test pit 5.

Figure 25. Photograph showing the spoil pile from the excavation of test pit 5.

Figure 26. Photograph showing excavation of test pit 6.

Figure 27. Photograph showing the completed excavation of test pit 6.

Figure 28. Photograph showing the spoil pile from the excavation of test pit 6.

History

The history of the area is tied to the local mining activities. The Iron Mountain Mine was the most important mine in Mineral County. A rich piece of rock from the deposit was discovered in 1888 by a boy looking for stray cattle (Montana DEQ, 2009). L. T. Jones paid the boy $10 to show him where he found the rock. Jones, along with Frank Hall and D. R. S. Frazier staked the Iron Mountain claim on August 28, 1888 and later staked another claim named the Iron Tower. The men shipped ten tons of ore to the smelter in Wickes, Montana. A payment of $1,400 from the smelter motivated J. K. Pardee to acquire the mining claims. Pardee initiated development of the mine in 1889 with financial backing from R. S. Hale, Thomas Cruse, and Samuel T. Hauser. In 1891 a 100-ton per day mill was constructed in Superior to concentrate the ore. The mill was fed by an aerial tramway. The mine continued operation with about 125 men employed until 1897 when it was closed by the State Inspector of Mines for having only one entrance in violation of state law.

In 1905 the Iron Mountain Tunnel Company leased the mine and planned a 5,560-foot-long tunnel to tap the deposit at a depth of 1,600 feet. Work commenced and production resumed around 1909. The company became entangled in legal disputes with its investors and went into receivership around 1915.

In July, 1915, the Federal Mining and Smelting Company of Idaho purchased the mine, concentrator, power line and supplies of the Iron Mountain Tunnel Company for $100,000 and the mine was put back into operation. This company had an agreement to sell all of its concentrates to the American Smelting and Reflning Company (ASARCO).

From 1909 until 1953 the mine produced 7,535,084 pounds of zinc, 5,385,741 pounds of lead, 5,274 pounds of copper, 19 ounces of gold, and 389,355 ounces of silver. Production from the early Iron Mountain Mining Company operations in the 1890's is not known, but the company paid about one half million dollars in dividends and was highly regarded as a rich silver mine.

No information was found about the history of the Wood Gulch Repository site. Test pit number I excavated for the Bureau of Reclamation investigation in 2010 uncovered rusted food cans and glass bottles showing prior use of the southeast portion of the site.

Repository Design

A good repository design demands that the waste material will remain isolated from the environment and have relatively minimal maintenance requirements. These fundamental requirements can be achieved by ensuring the repository is stable and design components are simple and robust. To be stable the repository must not be subject to slope failures due to embankment saturation or due to earthquake loading. The repository must be protected from flood inundation and storm water erosion. Isolation of the wastes demands the material be placed well above the water table, that storm water run on be prevented, and that a sufficiently durable cap be provided. A vegetative cover derived from a seed mix using native species will ensure a low maintenance cover. Drainage channels armored with riprap and a discharge culvert constructed using high density polyethylene pipe for road crossings will provide a storm water drainage system which is simple and of low maintenance.

To ensure geotechnical stability the repository foundation will be stripped of vegetation and topsoil and the toe of the slopes will be keyed into the existing ground by excavating the repository cells and roadways below the ground surface. The roads will be excavated into the ground to a depth of 1 foot prior to placing fill embankments. This excavation will ensure that all topsoil, tree stumps and organic material is removed prior to placing the road fills. The repository slopes will be constmcted at a slope of no more than 3.2H:1V to ensure slope stability is maintained. A capping layer which is 4 feet thick using the onsite granular soil will be utilized to ensure that the outer slopes have adequate geotechnical strength.

Since the site is wooded, cutting trees and clearing and grubbing of vegetation will be required. Topsoil will be excavated to its full depth and stockpiled for later reuse. For most of the site the topsoil is approximately 6-inches thick. Up to fifteen feet of the site sub-soil could be excavated and a portion of this removed for use as clean cover elsewhere in the Superfund Site if needed. A minimum of five feet of the sub-soil will need to be excavated and stockpiled in order to provide material for the road fills and the

cap. The test pits demonstrated that even with such soil removal there would still be a deep layer of dry soil underlying the repository. This will be confirmed with ground water monitoring wells. The mine wastes which are planned to be deposited in the repository consist of three types of materials: 1) fine-grained mill tailings mixed with topsoil and gravel which has been removed from yard areas in Superior, 2) coarse waste rock from the Iron Mountain Mine, and 3) stream sediments from Flat Creek. Some of the waste rock at the mine is acid generating and contains significant amounts of iron, lead, zinc, and antimony sulfide minerals. There also are iron salts present in some of the waste rock as evidenced by the white powdery coatings observed near the base of the waste rock pile adjacent to Flat Creek at the mine site. This material should be amended with crushed limestone and isolated inside the repository by first placing a thick layer of the waste removed from the yards in Superior. If the existing salts were to migrate from the waste rock, much of it would be absorbed by the fine-grained organic-rich soils from the yard removals. The stream sediments have not been fully characterized, however it is likely they are fine-grained and may have acid generating potential. These materials should be placed above the waste rock (or could be intermixed with it), and may need to be amended with crushed limestone if they are acid generating. It is also possible that treating the material with triple super phosphate to reduce leaching of metals may be necessary. It the sediments are fine-grained they may be of low geotechnical strength and should be kept away from the repository slopes. Placing the sediments in the flat areas of the repository above the waste rock and away from the slopes will ensure that the repository stability is not compromised.

Once all the waste is in place, the upper surface of the repository will be graded to a minimum slope so it will shed water. In order to prevent erosion from the concentration of storm water on the repository, a small berm will be placed along the outer edge of the repository and a swale will be used to tie the repository drainage to the perimeter ditches. This will allow storm-water runoff from the completed repository to be conveyed down to the toe of the slope in a controlled manner rather than allow the flow to break over the 3H:1V repository slopes where it could cause erosion of the cap. In addition to the four feet of granular soil cover, a six-inch thick layer of topsoil will be placed to complete the repository cap.

Drainage

The site has a cool and dry climate with average annual precipitation of 16.58?? inches (ATSDR, 2010). No flood hydrology studies were performed for sizing the channels due to the small size of the watersheds involved. The drainage channels were sized for construction convenience. There is approximately 10 acres of land upslope of the repository. The minon control channel will have a finished bottom width of 4 feet, 2H:1V side slopes, and a depth of 4 feet which will ensure adequate capacity during large storm events. The drainage channels will be lined with a gravel layer (6-inch plus size cobbles mixed with topsoil). Sizing of the riprap has not been completed but will be based upon the assumption that the channels are flowing at full depth along the steepest segments of the channel. Flow velocity will be determined using the Manning equation and lining material will be sized using the Army Corps of Engineers method.

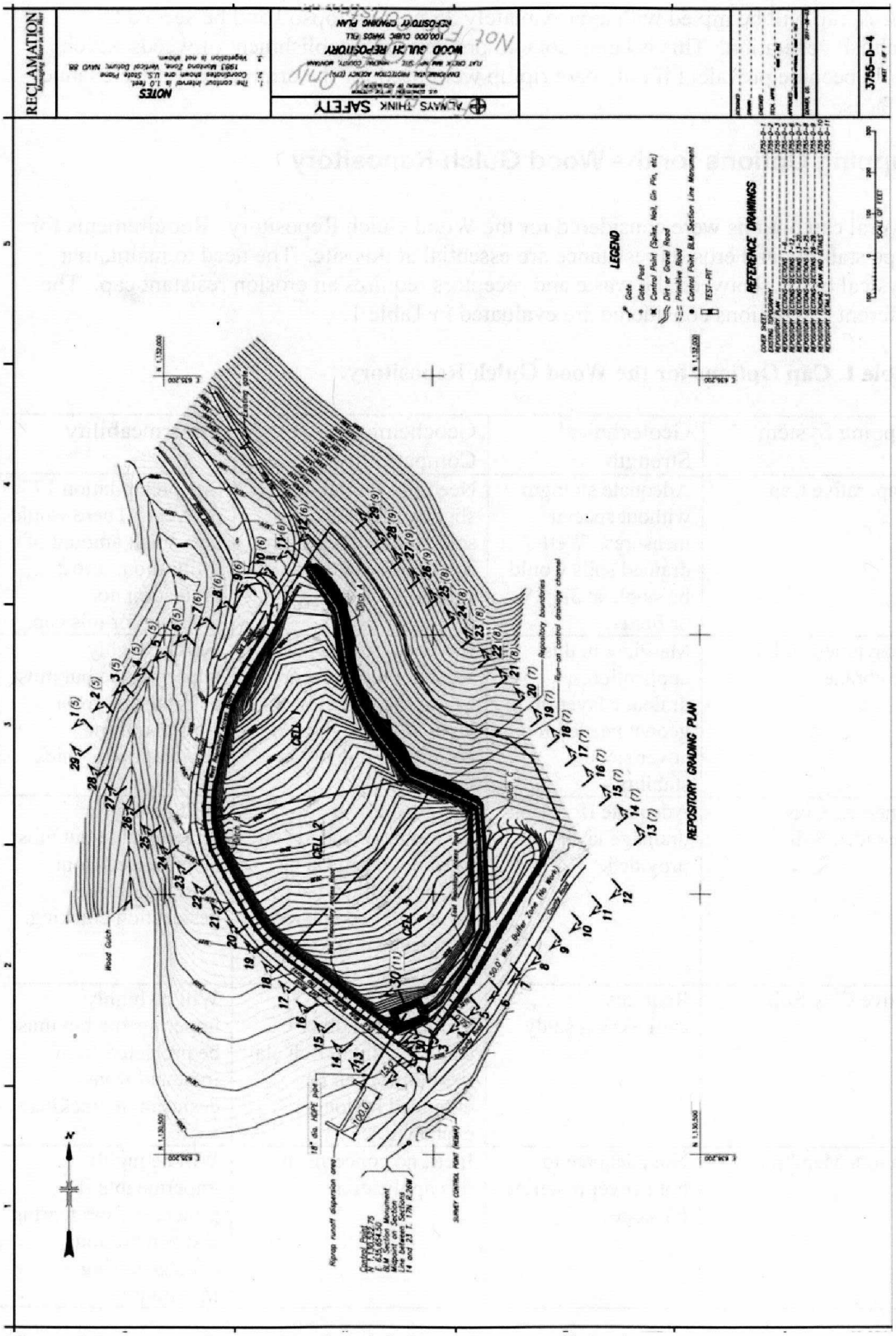

Figure 29. Proposed plan Wood Gulch Repository grading plan.

The riprap will be mixed with approximately 25 percent topsoil and be seeded to establish vegetation. This is being done to prevent the establishment of weeds which would become prevalent if only bare riprap were used for the armored drainage channel surfaces.

Capping Options for the Wood Gulch Repository

Several cap options were considered for the Wood Gulch Repository. Requirements for slope stability and erosion resistance are essential at this site. The need to maintain a physical barrier between the waste and receptors requires an erosion resistant cap. The different cap options considered are evaluated in Table 1.

Table 1. Cap Options for the Wood Gulch Repository.

Capping System	Geotechnical Strength	Geochemical Compatibility	Impermeability
Evaporative Cap	Adequate strength without special measures. Well drained soils would be stable at 3H:1V or flatter.	Need pH neutral to slightly alkaline cap soils to avoid leaching reactions with the mine waste.	Site precipitation 17" per year. There would be a small amount of infiltration. Frost protection not required for this cap.
Geosynthetic Clay Membrane	Marginal in this application, drainage layer or geonet needed for cover slope stability.	Cover soil over GCL must not leach Ca or Mg or the thin clay layer will become more permeable due to ion exchange.	Will be highly impermeable but must be protected from frost and from desiccation by thick soil cover.
Bentonite Clay Amended Soil	Adequate if drainage layer provided.	Cover soil over bentonite amended soil must not leach Ca or Mg or the thin clay layer will become more permeable due to ion exchange.	Will be highly impermeable but must be protected from frost and from desiccation cracking.
Native Clay Soil	Requires engineering study.	No concerns for kaolinite and other Ca clays. Sodium rich clay (bentonite) can be degraded by ion exchange.	Will be highly impermeable but must be protected from frost and from desiccation cracking.
Smooth Membranes	Not adequate to hold cover material on slopes.	Inert, no concerns in this application.	Will be highly impermeable if protected from tearing and penetration damage during installation.

Textured Membranes	Adequate if drainage layer provided, requires engineering study.	Inert, no concerns in this application.	Will be highly impermeable if protected from tearing and penetration damage during installation.

Selected Cap

The best options for this site are either an evaporative cap or a textured geomembrane cap. Caps involving bentonite clays are not recommended given that the soils may be calcarious. There are thick deposits of granular soils on the site so an evaporative cap could be constructed using the onsite material. Although a geomembrane would be more impermeable, it would require processed soils for subgrade and drainage layers, therefore it would be considerably more expensive than an evaporative cap. An evaporative cap is recommended as the most practical for this site.

An evaporative cap consisting of 4 feet of the local granular soil (a mixture of silt, sand, gravel, and cobble size material) covered by 6-inches of topsoil would be appropriate for this site given its approximate 17 inches of average annual precipitation. After the repository slopes are covered with topsoil they will tend to shed water. The granular soil under the topsoil contains enough sand and silt size material to act as a storage layer for moisture. When water does break through the topsoil (expected during the spring snow melt) the 4-feet of granular soil will have storage capacity to hold most of the infiltration until evaporation can remove the water from the ground. In order to provide a second capillary break, the 4-foot-thick layer of granular soil will be further subdivided into a 1 – foot-thick compacted layer (two 0.5 ft thick compacted lifts) of screened soil will be placed immediately over the mine waste, followed by 3 feet of unscreened granular soil.

Construction Requirements

Construction of the repository will consist of installation of environmental controls, site preparation including clearing and stripping topsoil, establishment of perimeter roads, construction of drainage features,excavation of subsoil, placement of waste, capping, and establishment of vegetation.

Environmental Protection

Construction activities at the site will be constrained by the need to protect Flat Creek and Wood Gulch from sedimentation, preservation of trees and vegetation which will remain adjacent to the repository, and preserving existing roads along Flat Creek and Wood Gulch. Environmental protection such as dust, erosion, and sediment control is critical to project success. Erection of silt fence and construction barrier fencing will be performed to limit project disturbance. Water will be utilized for dust control, and a temporary sediment trap will be excavated and lined with cobbles to ensure that storm-

water runoff from the disturbed areas is settled prior to discharge. The drainage ditches will be lined with a mixture of cobbles and topsoil and be seeded.

The cell design is such that the mine waste will be placed in a manner that storm water runoff from the waste will be trapped in the cell excavation and can not migrate into the site drainage ditches. If excess water builds up in the cell, it will be disposed by sprinkling the waste surface and be allowed to evaporate.

Historic Preservation Office

The uncovering of cans and bottles in test pit 1 indicates past use of the southeast portion of the repository site. EPA has decided to have an archeologist investigate the site to address historic and cultural issues. This work will be documented separately and coordinated with the State Historic Preservation Officer (SHPO). EPA's construction contractor "ER" is aware of SHPO requirements which would require stopping work if historic materials are encountered. No historic (greater than 50 years old) features or artifacts can be removed until approval from the SHPO is received.

Cell Excavation and Waste Placement

After stripping and stockpiling topsoil, and construction the site roads and ditches, the cell subsoil will be removed and stockpiled. The cells will be excavated sequentially from north to south (Cell 1 first). The subsoil will be stockpiled for reuse. Some of the site soil will be processed by screening to produce a 2-inch minus screened soil, a 2-inch to 6-inch size gravel for road construction, and a plus 6-inch (gravel to cobbles) to be used as ditch erosion control liner.

The mine waste shall be placed in thin horizontal lifts (maximum of 1 foot thick) and be compacted. Moisture control is required to suppress dust and enhance waste compaction. Compaction will be by routing haul trucks over the fill as it is placed.

Capping

Capping material is expected to be obtainable from the Site. It is expected that both topsoil and granular cover material will be excavated and stockpiled from the areas to be disturbed (repository area, perimeter roads, and drainage channel excavations). An excess of about 35,000 cubic yards is expected which will provide material for the road fills, ditch gravel erosion control lining, and for use outside the repository for restoration activities in town and at the mine site. All of the stockpiled topsoil will be reused at the repository site.

Construction Sequence

The Site construction activities will be sequenced for efficient control of the work. The following sequence is anticipated:

- Install warning signs along County Road for traffic safety.
- Mobilize equipment to the site.
- Set up pumping plant along Flat Creek to obtain water for dust control.
- Install silt fences for environmental protection.
- Survey for construction control and stakeout.
- Remove vegetation from the site for recycling and landfill disposal as approprate.
- Strip topsoil and stockpile for reuse.
- Partially excavate cell 1 repository area to obtain clean granular soil stockpile for screening to produce needed road gravel and ditch erosion control lining.
- Establish perimeter roads by grading and place gravel surfacing material.
- Install site boundary fencing.
- Excavate drainage channels and install channel liners.
- Excavate a small sediment trap to control storm water mnoff from clean disturbed areas.
- Excavate remainder of cell 1 to produce stockpile of clean granular soil material.
- Transport mine waste to repository and place in thin lifts which are compacted by haulage equipment traffic.
- Perform final grading to shape repository cell and adjust drainage channels if necessary.
- Install cap materials.
- Seed, fertilize, and mulch repository cap, drainage channels, and stockpile areas.
- Demobilize equipment and remove temporary road warning signs.
- In future years repeat the last six steps as cells are added.

References

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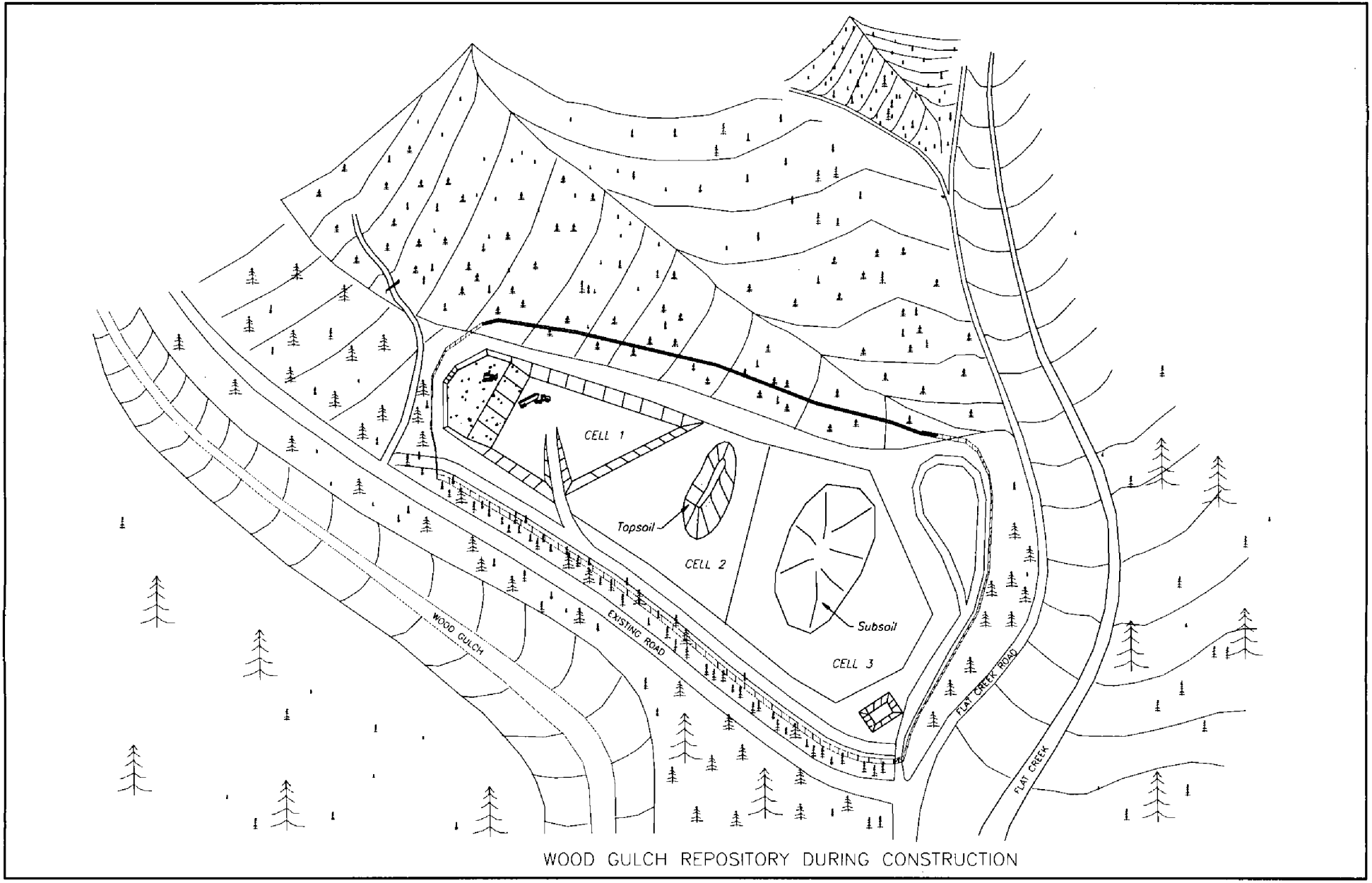
URS Operating Services, Inc. (2007) Preliminary Assessment, Superior Waste Rock, Superior, Mineral County, Montana.

USGS (1986) Geologic and stmcture maps of the Wallace 1 x 2 Quadrangle, Montana and Idaho. U. S. Geological Survey Miscellaneous Investigations Series Map I-1509-A.



WOOD GULCH REPOSITORY DURING CONSTRUCTION

Figure 3

TABLE 1: Detail of Residential Samples in High Concentration Category

Sample Loc.	High Concentration by Depth lead (*arsenic*)				Sample Loc.	High Concentration by Depth lead (*arsenic*)			
	0 to 2"	2 to 6"	6 to 12"			0 to 2"	2 to 6"	6 to 12"	
RY006-D*	3150 (*790*)	mod (*mod*)	low (*low*)	D	RY102-D*	5140 (*732*)	2130 (*427*)	mod (*low*)	D
RY021-D	low (*low*)	low (*low*)	1820 (*51*)	D	RY125-D*	mod (*mod*)	3840 (*653*)	mod (*678*)	D
RY030-D*	low (*mod*)	7910 (*1200*)	low (*low*)	D	RY198-D*	4320 (*584*)	3940 (*mod*)	low (*low*)	D
RY036-D	1710 (*737*)	mod (*mod*)	mod (*mod*)	D	RY240-D*	low (*low*)	mod (*mod*)	5540 (*813*)	D
RY053-C*	mod (*mod*)	7910 (*1680*)	2940 (*520*)	D	RY303-D*	6200 (*1750*)	mod (*mod*)	4090 (*570*)	D
RY086-D*	7530 (*1440*)	5740 (*1400*)	4700 (*1090*)	D	RY338-C*	5050 (*579*)	4350 (*468*)	3190 (*327*)	D
RY091-D*	3310 (mod)	mod (*mod*)	2570 (*mod*)	D	RY387-D*	5990 (*592*)	mod (*low*)	mod (*low*)	D
RY091-E	1670 (*mod*)	low (*low*)	low (*low*)	D	RY422-D	2110 (*299*)	mod (*low*)	low (*low*)	D
RY101-D	2,600 (*524*)	mod (*low*)	low (*low*)	D	RY506-D	mod (*low*)	2190 (*mod*)	mod (*low*)	D
RY030-E	low (*low*)	1880 (*1,200*)	low (*low*)	Y	RY176-E	low (*low*)	2190 (*low*)	low (*low*)	Y
RY043-B*	low (*low*)	17,700 (*172*)	low (*low*)	Y	RY240-B*	low (*low*)	4340 (*434*)	low (*low*)	Y
RY084-C*	4630 (*450*)	mod (*mod*)	mod (*mod*)	Y	RY257-C	2660 (*mod*)	low (*low*)	low (*low*)	Y
RY086-A	1300 (*mod*)	2050 (*mod*)	low (*low*)	Y	RY304-C*	low (*low*)	4290 (*474*)	3810 (*mod*)	Y
RY092-C	mod (*mod*)	1860 (*mod*)	1500 (*mod*)	Y	RY506-F*	3790 (*mod*)	36800 (*1880*)	2250 (*mod*)	Y
RY101-A*	low (*low*)	low (*low*)	3800 (*552*)	Y	RY600-A	3340 (*415*)	1150 (*491*)	17800 (*mod*)	Y
RY101-C*	3090 (451)	2980 (*539*)	mod (*mod*)	Y	RY045-D*	5470 (*1190*)	low (*low*)	low (*low*)	B
RY130-B	1410 (*mod*)	low (*low*)	low (*low*)	Y	RY094-F*	7240 (*mod*)	5690 (*mod*)	2160 (*mod*)	B
RY140-B	low (*low*)	2880 (*815*)	2080 (*mod*)	Y	RY213-B	mod (*mod*)	mod (*mod*)	1960 (*mod*)	B
RY140-C*	low (*low*)	3550 (*613*)	low (*low*)	Y	RY523-C	6839 (*598*)	2300 (*543*)	721 (*mod*)	B
RY148-B*	4030 (*1710*)	3420 (*695*)	2730 (*mod*)	Y					

*Emergency removal conducted in 2010
All concentrations in ppm
Y = yard, D = driveway, B = bare area
Yellow highlights = concentrations >2500 ppm Pb or 400 As

TABLE 1 (Continue): Detail of Non-Residential Samples in High Concentration Category

Sample Loc.	High Concentration by Depth lead (*arsenic*)			Sample Loc.	High Concentration by Depth lead (arsenic)		
	0 to 2"	2 to 6"	6 to 12"		0 to 2"	2 to 6"	6 to 12"
RY098-A	mod (*mod*)	1260 (*mod*)	1350 (*mod*)	RY289-G*	2750 (*1340*)	7080 (*1500*)	low (*low*)
RY111-B	low (*low*)	low (*low*)	1330 (*439*)	RY332-B*	low (*low*)	mod (*low*)	4150 (*mod*)
RY112-A*	low (*low*)	low (*low*)	4740 (*655*)	RY398-A	mod (*low*)	1250 (*low*)	1310 (*low*)
RY115-A*	13300 (*1380*)	6690 (*1210*)	20400 (*754*)	RY398-B	mod (*low*)	2480 (*462*)	mod (*mod*)
RY115-E	mod (*mod*)	2930 (*465*)	mod (*mod*)	RY402-A	13900 (*low*)	low (*low*)	low (*low*)
RY118-O*	3430 (*619*)	mod (*mod*)	mod (*404*)	RY627-B	6700 (*2620*)	3690 (*985*)	1460 (*mod*)
RY118-P*	13800 (*1750*)	3250 (*681*)	5740 (*3370*)	RY627-C	1270 (*mod*)	5810 (*1240*)	2790 (*555*)
RY146-B	low (*low*)	low (*low*)	low (*425*)	RY627-D	low (*low*)	6000 (*933*)	1980 (*mod*)

*Emergency removal conducted of selected sampling areas in 2010.